A Marine Biological Study of Brevoort Harbour and Nearby Waters of Eastern Baffin Island

Arctic Biological Station
Department of Fisheries and Oceans
Ste. Anne de Bellevue, Quebec H9X 3L6

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No. 1557

January 1980

A MARINE BIOLOGICAL STUDY OF BREVOORT HARBOUR AND NEARBY WATERS OF EASTERN BAFFIN ISLAND

A report prepared for the Offshore
Environment Division, Department of Indian Affairs
and Northern Development

Arctic Biological Station

Department of Fisheries and Oceans
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DISCLAIMER

The data used in this report were obtained in the course of investigations sponsored by the Offshore Environment Division, Department of Indian Affairs and Northern Development to provide information relevant to the assessment of offshore hydrocarbon exploration proposals.

Any opinions or conclusions expressed in this report are those of the authors and are not necessarily shared by the Government of Canada.

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ABSTRACT

Arctic Biological Station. 1980. A marine biological study of Brevoort Harbour and nearby waters of eastern Baffin Island. A report prepared for the Offshore Environment Division, Department of Indian Affairs and Northern Development. Can. MS Rep. Fish. Aquat. Sci. 1557: 208 p.

The waters of the Brevoort Island area showed strong arctic characteristics during the summer of 1979. Apart from the seasonally warmed and occasionally freshened surface, waters were generally colder than 0°C and more saline than 32°/$_{oo}$. Phosphate, silicate and ammonia were found in significant quantity at nearly all sampled depths. Only nitrate was depleted in the upper 10 m at a few stations.

The phytoplankton standing stock ranged from 5 to 2190 X 10^3 cells per litre, with highest values occurring in the upper 20 m and usually near shore. Diatoms dominated (66 species), and there were fewer flagellates, dinoflagellates, chrysophytes and blue-green algae. *In situ* primary production ranged from 0.66 to 7.98 mg C per m^3 per hour, or from about 92 to 204 mg C per m^2 per hour. Assimilation numbers, 0.31 to 3.80 mg C per mg chlorophyll a per hour, showed correlations with depth and temperature. Light and temperature were found to be the principal factors controlling productivity in the (nutrient-rich) waters, light affecting activity in the deeper waters, temperature influencing rates nearer the surface.

The standing stock of zooplankton ranged from 61 to 321 mg (wet) per m^3 in the fine (mainly herbivorous) fraction, and from about 1 to 32 mg (wet) per m^3 in the coarse (largely carnivorous) portion. The zooplankton consisted of 74 species comprising a predominantly arctic fauna with a small warmer-water (Atlantic) element. Several species showed diurnal vertical migration, resulting in a large shift of biomass between day and night, and establishment of a concentrated layer of zooplankton just beneath the surface during the hours of darkness. Some of these species formed important parts of the pelagic food web. A few zooplankton groups (mysids, coelenterates, hyperiid amphipods, pteropods and ctenophores) accounted for more than 90% of the energy in the macrozooplankton community in Brevoort Harbour. These groups formed the bulk of the macrozooplankton species which entered into the local food web culminating in such top carnivores as seals, birds and fishes.

There are 37 fish species known from the Davis Strait coast of Baffin Island and Frobisher Bay. Most are common eastern arctic species, but a few relatively rare ones include Atlantic water forms. *Gymnocanthus tricuspis*, *Triglops pingeli* and *Icelus* were the most abundant pelagic larval fishes found in the present survey. Many of the larval species showed pronounced diurnal vertical migrations, with mean daytime and nighttime estimates of 28.2 and 50.7 pelagic larvae per 1000 m^3 through the vertical ranges inhabited during the two time periods. Larval fishes evidently fed

actively on nocturnal concentrations of zooplankton prey in the surface waters. A mean hatching date of June is indicated for all fish species with pelagic larvae, with most species completing the pelagic larval existence by autumn.

Grab collections of zoobenthos (essentially infauna) contained from 38 to 159 species, and dredge-caught material (essentially epifauna) added another 28, to give a total of 286 identified zoobenthic species taken at Brevoort Island. Most are well known from elsewhere in the Canadian arctic. The grab-caught material gave a dry weight biomass range of 6 to 42 g per m^2, and the dredge-caught animals averaged about 0.5 g per m^2 dry weight. Standing stocks were greatest on bottoms at depths of 30 to 70 m. At stations deeper than 30 m, 10% of the species accounted for 90% of the biomass.

Key words: Arctic waters, Canada coast, marine fauna, marine flora, phytoplankton, primary production, zooplankton, zoobenthos, fish larvae, vertical distribution, ice fauna, nutrients, feeding.

RESUME

Arctic Biological Station. 1980. A marine biological study of Brevoort Harbour and nearby waters of eastern Baffin Island. A report prepared for the Offshore Environment Division, Department of Indian Affairs and Northern Development. Can. MS Rep. Fish. Aquat. Sci. 1557: 208 p.

Durant l'été 1979, les eaux de la région de l'Ile Brevoort ont montré de fortes caractéristiques du milieu arctique. Mises à part les variations saisonnières de température et le dessalement occasionnel des eaux de surface, la température de l'eau se situait généralement sous 0°C tandis que la salinité dépassait 32°/$_{oo}$. Les phosphates, silicates et l'ammoniaque sont présents en quantité significative à presque toutes les profondeurs échantillonnées. Seuls les nitrates étaient épuisés dans les 10 premiers mètres, à quelques stations.

Le stock *in situ* de phytoplancton s'échelonne de 5 à 2190 X 10^3 cellules par litre, les plus grandes concentrations se retrouvant dans les premiers 20 mètres, généralement près de la côte. Les diatomées dominent (66 espèces) tandis que les flagellées, les dinoflagellées, les chrysophytes et les algues bleues sont en moins grand nombre. *In situ*, la production primaire s'échelonne de 0.66 à 7.98 mg C par m^3 par heure ou d'environ 92 à 204 mg C

par m^2 par heure. Les nombres d'assimilation de 0.31 à 3.80 mg C par mg de chlorophylle a par heure, sont en corrélation avec la température et la profondeur. La lumière et la température sont les principaux facteurs contrôlant la productivité dans les eaux (riches en éléments nutritifs), la lumière affectant l'activité dans les eaux profondes, la température influençant les taux d'assimilation dans les eaux de surface.

Le stock *in situ* de zooplancton se répartit entre 61 et 321 mg (poids humide) par m^3 pour la fraction la plus fine (principalement herbivores) et entre 1 et 32 mg (poids humide) par m^3 environ, pour les fractions grossières (en grande partie carnivores). Le zooplancton est constitué de 74 espèces comprenant une faune arctique prédominante de même qu'une représentation restreinte provenant d'eaux plus chaudes (Atlantique). Plusieurs de ces espèces effectuent une migration verticale diurne, engendrant un grand déplacement de la biomasse entre le jour et la nuit, et l'établissement d'une couche concentrée de zooplancton, juste sous la surface, durant les heures d'obscurité. Certaines de ces espèces forment une part importante de la chaîne alimentaire pélagique. Quelques groupes seulement du zooplancton (mysidacées, coelentérées, amphipodes hypérides, ptéropodes et cténophores) constituent plus de 90% de l'énergie dans la communauté du macrozooplancton de Brevoort Harbour. Ces groupes forment une part importante des espèces du macrozooplancton entrant dans la chaîne alimentaire locale se terminant par les carnivores supérieurs tels les phoques, les oiseaux et les poissons.

Il existe 37 espèces de poissons connues provenant de la côte du Détroit de Davis le long de la Terre de Baffin et de la baie de Frobisher. On retrouve la plupart des espèces communes de la partie est de l'Arctique à l'exception de quelques rares spécimens provenant de l'Atlantique. *Gymnocanthus tricuspis*, *Triglops pingeli* et *Icelus* comptent parmi les larves de poissons pélagiques les plus abondantes que nous ayions récoltées dans cet inventaire. Plusieurs des espèces au stade larvaire montrent une migration verticale diurne prononcée, avec une moyenne diurne et nocturne estimée à 28.2 et 50.7 larves pélagiques par 1000 m^3 le long de la colonne d'eau occupée durant les deux périodes. Les poissons, au stade larvaire, se nourissent activement à même les concentrations nocturnes de zooplancton dans les eaux de surface. Toutes les espèces de poisson ayant des larves pélagiques, ont une date moyenne d'éclosion de leurs oeufs en juin et la majorité aura complété son existence au stade de larve pélagique dès l'automne.

Le zoobenthos des échantillons de benne (essentiellement l'endofaune) se compose de 38 à 159 espèces, et si l'on y ajoute les 28 espèces provenant du matériel (essentiellement épifaune) capturé avec une drague, on obtient alors un total de 286 espèces zoobenthiques identifiées, ramassées à l'Ile Brevoort. La plupart sont bien connues des autres régions de l'Arctique canadien. Le poids sec de la biomasse du matériel récolté à l'aide de la benne varie entre 6 et 42 gr par m^2 et les animaux capturés à la drague représentent une moyenne de 0.5 gr par m^2, poids sec. C'est sur les fonds situés à des profondeurs variant entre 30 et 70 m que l'on retrouve les stocks *in situ* de plus grande importance. Aux stations atteignant des profondeurs supérieures à 30 m, 10% des espèces rencontrées représentent 90% de la biomasse.

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1. Introduction

E. H. Grainger

OBJECTIVES

The objectives of the marine biological study of Brevoort Harbour and nearby waters of eastern Baffin Island were to describe physical and chemical features of the region in spring and summer, to show seasonal variations in content and biomass of the phytoplankton, zooplankton, zoobenthos and fishes, to investigate the fauna of the late spring sea ice, and to define ecological relationships within the system, especially through the food web.

METHODS

Collecting stations (Table 1-1) were occupied within Brevoort Harbour and along a line running about 10 km to the south (Fig. 1-1). Additional material is considered here from Cornelius Grinnell Bay (Fig. 1-1), and from the head of Frobisher Bay (63°42.7'N, 68°30.7'N).

Attempts to work on the sea ice in Brevoort Harbour in June were unsuccessful because of unexpectedly early ice deterioration. As a result, observations on sea ice were carried out instead at the head of Frobisher Bay, and some of the data collected there used in this report. Cornelius Grinnell Bay stations were occupied in July and again in September, when weather conditions prohibited working in Brevoort Harbour during the period of availability of the boat used. The major effort of the study was put into the August cruise of M.V. *Calanus*, research vessel of the Arctic Biological Station. It was during that period that the Brevoort Island material was obtained.

Field observations were made from the sea ice surface (in Frobisher Bay), from a small, Inuit-owned vessel (Cornelius Grinnell Bay) and from the research vessel *Calanus* (Brevoort Harbour and vicinity). Water samples were collected with 5-litre Van Dorn or 1.6-litre Niskin closing samplers. Water temperatures were determined using a Montedoro-Whitney model CTU-3B *in situ* probe (values expressed in the accompanying tables to 2 decimal places) or a laboratory thermometer (values in the tables given to one decimal place). All salinity values used were derived from post-collection analysis of water samples using a Bissett Berman model 6230 laboratory salinometer. Dissolved oxygen was calculated from water samples by the

Table 1-1. East Baffin Island stations.

Station number	Date	Depth (m)	N. Latitude	W. Longitude	Location
79-A	8-13 Aug.	35-37	63°18.55'	64°08.23'	Brevoort Hbr.
79-B	6, 10 Aug.	13	63°19.40'	64°10.10'	Brevoort Hbr.
79-C	12 Aug.	77	63°17.08'	64°07.38'	S. of Brevoort I.
79-D	5, 11 Aug.	146	63°15.00'	64°07.40'	S. of Brevoort I.
79-E	11 Aug.	245	63°13.00'	64°08.30'	S. of Brevoort I.
79-F-a	20 July	55	63°18.75'	64°46.00'	Cornelius Grinnell B.
79-F-a	17 Sept.	55	63°18.75'	64°46.00'	Cornelius Grinnell B.
79-F-b	20 July	0+	63°19.10'	64°44.60'	Cornelius Grinnell B.
79-F-b	17 Sept.	0+	63°19.10'	64°44.60'	Cornelius Grinnell B.
79-F-c	20 July	41	63°18.10'	64°46.90'	Cornelius Grinnell B.
79-F-d	20-21 July	29-55	63°17.85'	64°43.20'	Cornelius Grinnell B.
79-F-d	16-17 Sept.	29-62	63°17.85'	64°43.20'	Cornelius Grinnell B.
79-F-e	21 July	35	63°18.25'	64°43.50'	Cornelius Grinnell B.
79-F-e	18 Sept.	55	63°18.25	64°43.50	Cornelius Grinnell B.
79-G	6-13 Aug.	0+	63°19.10'	64°10.20'	Brevoort Hbr.

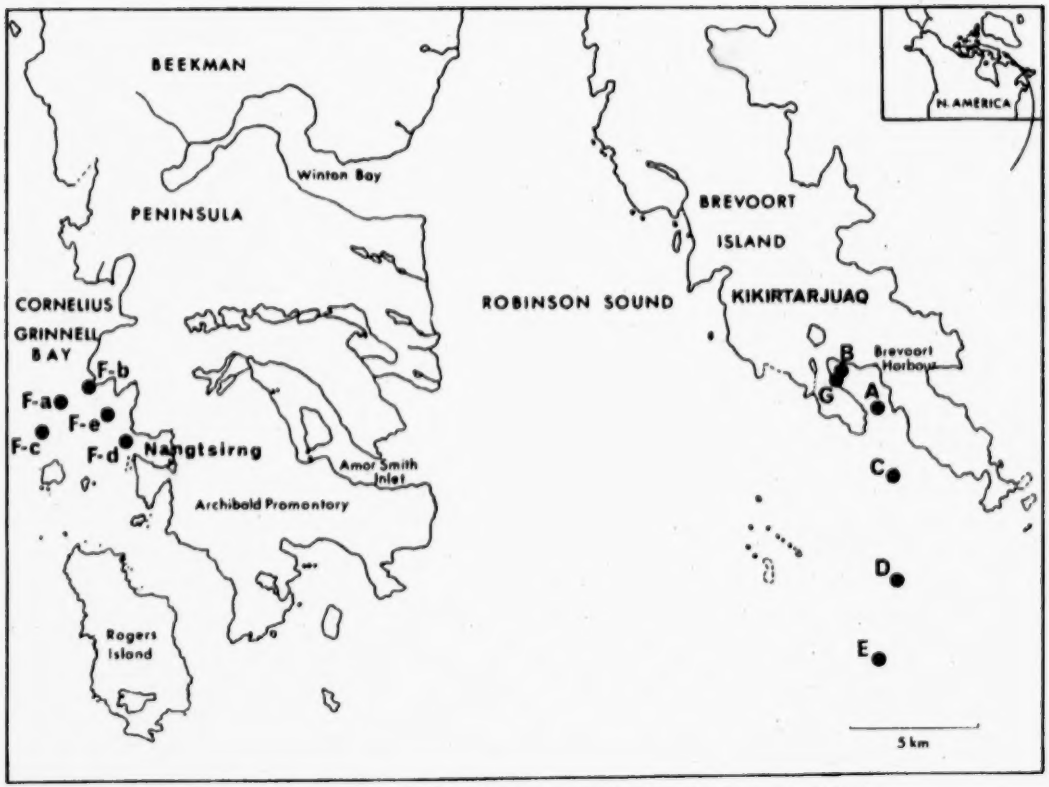

Fig. 1-1. Map showing the locations of stations in the Brevoort Island area and in Cornelius Grinnell Bay.

standard Winkler method, and nutrients were determined following the methods of Strickland and Parsons (1968).

Other methodology, having particular relevance to subjects treated in the following sections, will be described in the appropriate parts of this report.

THE REGION

Brevoort Harbour, at about 63°19'N, 64°08'W, is located at the southern tip of Brevoort Island (Fig. 1-1). It opens to the southsoutheast between a sheer headland of about 226 m on the west and a slightly lower but equally precipitous land mass on the eastern side of the Bay (Canada 1968). The harbour itself is about 4 km long and a little more than 1 km wide. Depths range from about 36 m in the vicinity of the entrance and over a fairly large area within the harbour to lesser depths close to shore. Shores are steep both above and below water level and consist of large boulders not infrequently augmented by slides from the steep cliffs above. The only landing beach is in the northeast part of the harbour. It is located where a boulder-filled stream bed runs down a moderately steep valley to the bay, and forms the only break in the otherwise precipitous border of the harbour. Tides are semi-diurnal, with an average range of about 4 m and a maximum of a little over 6 m (Canada 1979).

Cornelius Grinnell Bay lies between Beekman Peninsula and Hall Peninsula. It is a long, relatively narrow inlet bordered by high land on both sides. Just north of Rogers Island and to the west of Nangtsirng, a group of islands form a somewhat sheltered area (about 63°18'N, 64°44'W) in which additional collections were made. This location is about 30 km directly west of Brevoort Harbour. Depths reach to a maximum of about 60 m. The adjacent coast is steep with deep water close to shore. There is an appreciable flow of fresh water through Smith Channel into northern Cornelius Grinnell Bay and from rivers which empty directly into the west side of the bay (Canada 1968). In contrast, fresh water influence in Brevoort Harbour is relatively slight.

PHYSICAL OCEANOGRAPHY AND NUTRIENTS

Eastern Baffin Island is washed by the cold, arctic (in the sense of Dunbar (1951), meaning water of Arctic Ocean origin) Baffin current which flows southward along the west side of Baffin Bay and Davis Strait. Along the southern part of the east Baffin coast, there is some mixing with non-arctic water coming in from West Greenland. Brevoort Island and the waters near it lie in this region of primarily arctic water with a relatively small and probably variable Atlantic intrusion.

The general current pattern in Davis Strait and neighbouring waters was discussed by Dunbar (1951) in his physical oceanographic survey of the eastern Canadian arctic. His treatment of west Davis Strait is largely

dependent upon work done from the Danish vessel *Godthaab* in 1928 and from the U.S. vessels *Marion* and *General Greene* between 1928 and 1935. Since then, the comparatively few accounts of physical and chemical oceanographic work carried out in western Davis Strait have included a report on the Norwestlant 2 survey of 1963 (Lee 1968), some data on nutrients collected by the U. S. Coast Guard in 1965 (McGill and Corwin 1967) and reports on MacLaren cruises (MacLaren Atlantic 1978a, 1978b, MacLaren Marex 1979a, 1979b).

Brevoort Harbour usually freezes over between mid-October and mid-December and opens between mid-June and mid-July (Allen and Cudbird 1971). It is therefore ice-bound from at least 6 to as many as 9 months each year. There are no data available on ice cover duration in Cornelius Grinnell Bay, but it is probable that the timing of events is not greatly dissimilar to what is found at Brevoort.

All water temperatures recorded here in the Brevoort region and in Cornelius Grinnell Bay below about 10 m were less than 0°C (Tables I-1 to I-8; Fig. 1-2). Even the deepest station (79-E) showed its lowest temperature (-1.2°) near the bottom, at 230 m, with no sign of deep intruding warmer water. Only at 10 m and above were plus temperatures found, and they probably indicated seasonal surface warming. The highest of these was a little more than 3° at the innermost, shallowest and most sheltered Brevoort Harbour station (79-B).

Salinity (Tables I-1 to I-8; Fig. 1-3) was lower in Cornelius Grinnell Bay than around Brevoort Island in the upper 10 m. This was evidently the consequence of a greater quantity of fresh water reaching station 79-F than the Brevoort Island area. Below 10 m, salinity was around 33°/$_{oo}$ everywhere, reaching a maximum of 33.383°/$_{oo}$ at the bottom of station 79-E.

Dissolved oxygen (Fig. 1-4) ranged from a little more than 10 to about 8 mL/L (Tables I-1 to I-8). Highest levels were most often below the surface, between 3 and 10 m, lowest usually at the deepest levels sampled.

Silicate (Fig. 1-5) was present at all but a single sampled depth. Surface values were usually less than 2 µg-at/L except at station 79-A on 13 August where they were higher than 4 µg-at/L. In deeper water silicate was higher than 10 µg-at/L at 126 m at station 79-D, a level very close to what McGill and Corwin (1967) found at 100 m a few miles farther from shore.

Phosphate (Fig. 1-6) was low but present, as 0.4 to 0.7 µg-at/L, at all depths near the surface. It reached a maximum of nearly 1 µg-at/L at about 100 m. The 50-m deep "bubble" of phosphate reported by McGill and Corwin (1967), in which values greater than 1 µg-at/L occurred only a short distance from the shores of Brevoort Island, did not appear at station 79-D.

Nitrate (Fig. 1-7) showed summer depletion in the upper 10 m at most stations. This seems to be a characteristic of northern marine waters, having been shown in nearby Frobisher Bay (Grainger 1979) and offshore in Davis Strait (McGill and Corwin 1967). The exception in this material is

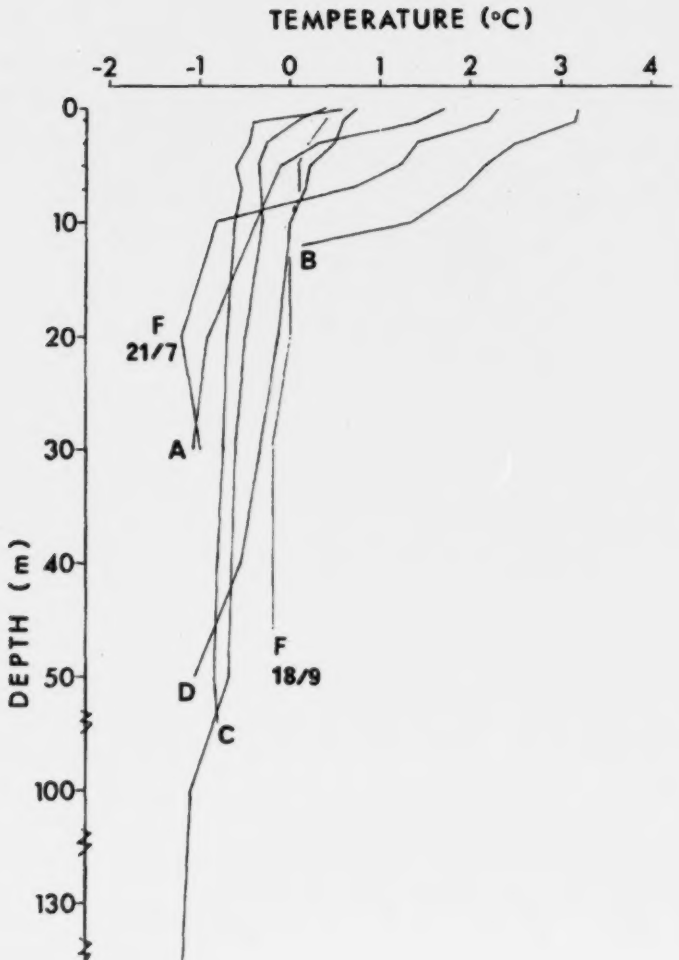

Fig. 1-2. Water temperature profiles. The curve for station A is the average for 2 observation dates.

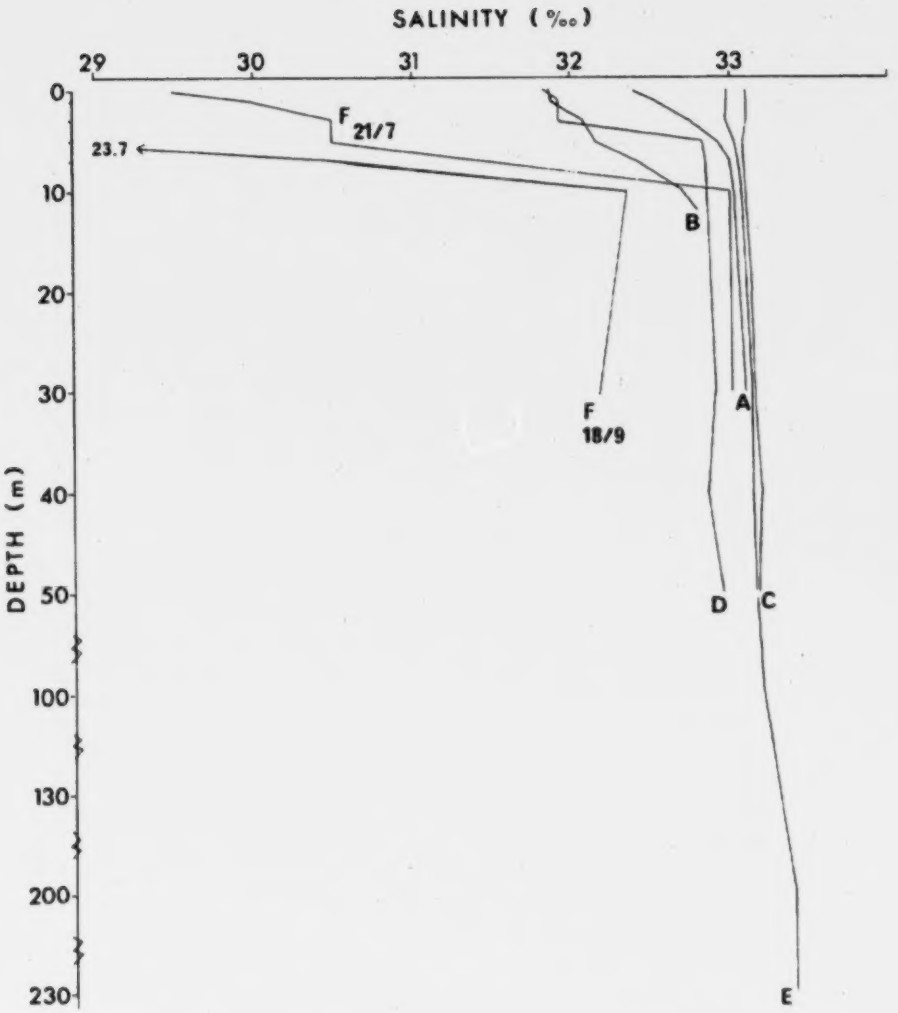

Fig. 1-3. Salinity profiles. The curve for station A is the average for 2 observation dates.

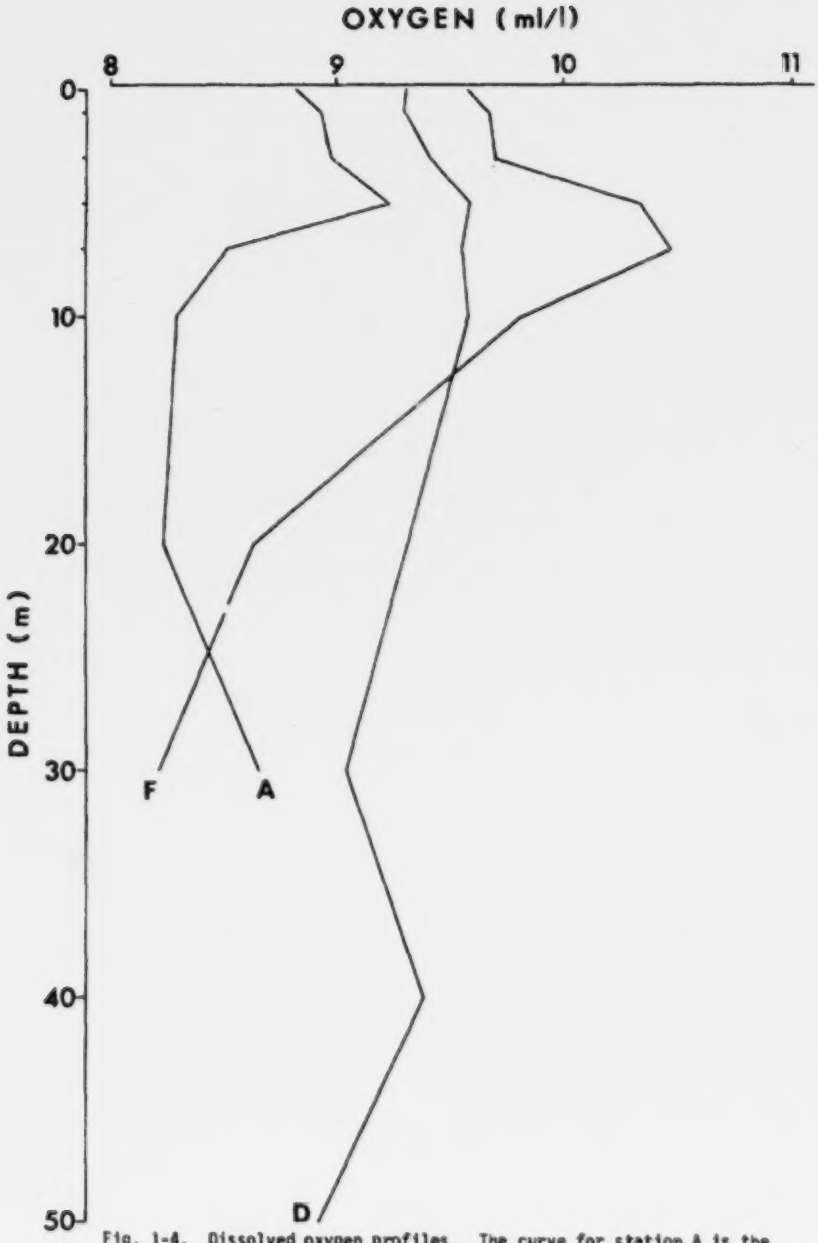

Fig. 1-4. Dissolved oxygen profiles. The curve for station A is the average for 2 observation dates.

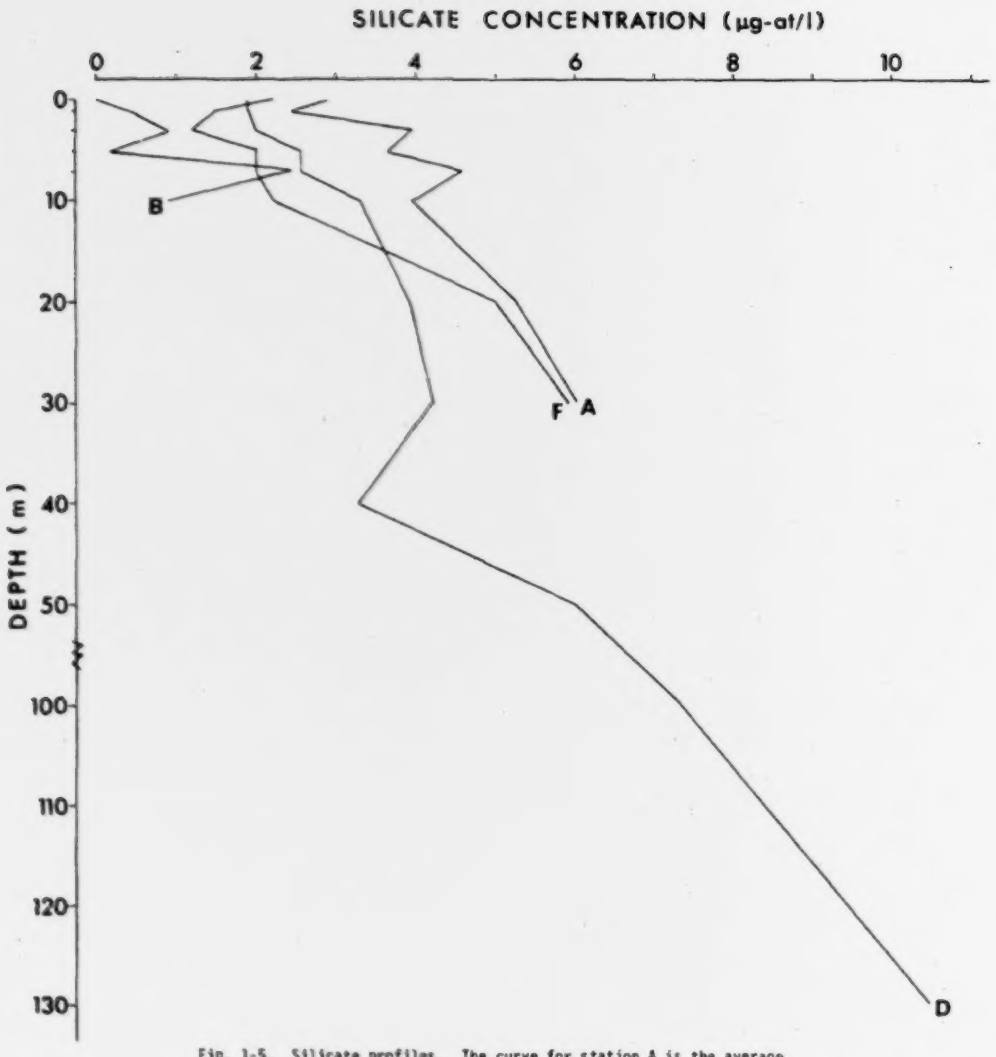

Fig. 1-5. Silicate profiles. The curve for station A is the average for 2 observation dates.

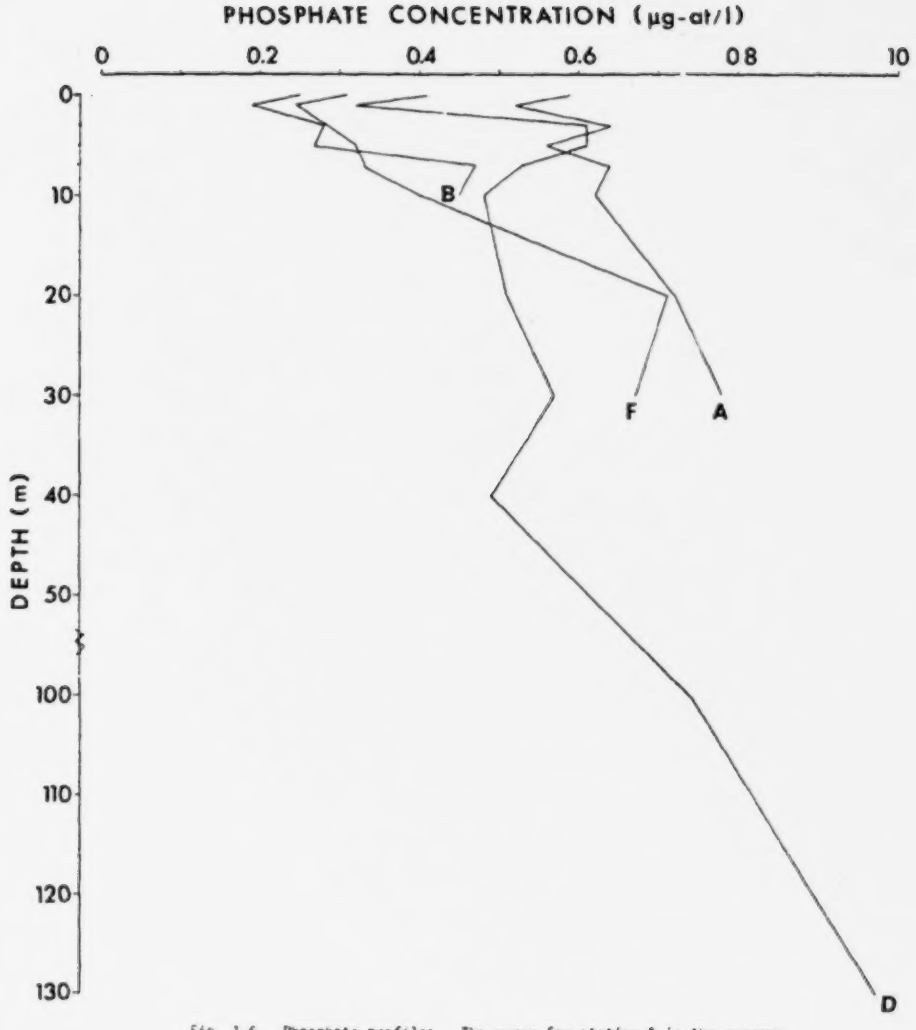

Fig. 1-6. Phosphate profiles. The curve for station A is the average for 2 observation dates.

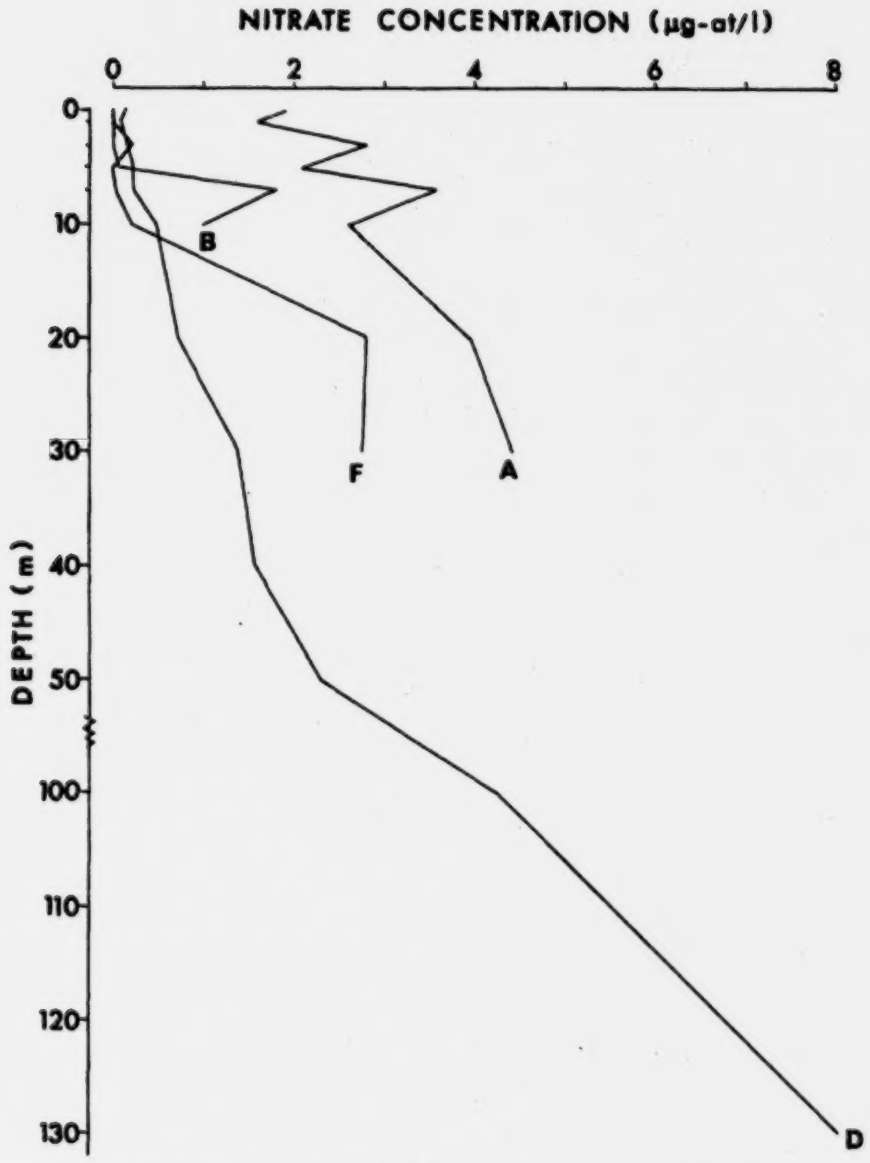

Fig. 1-7. Nitrate profiles. The curve for station A is the average for 2 observation dates.

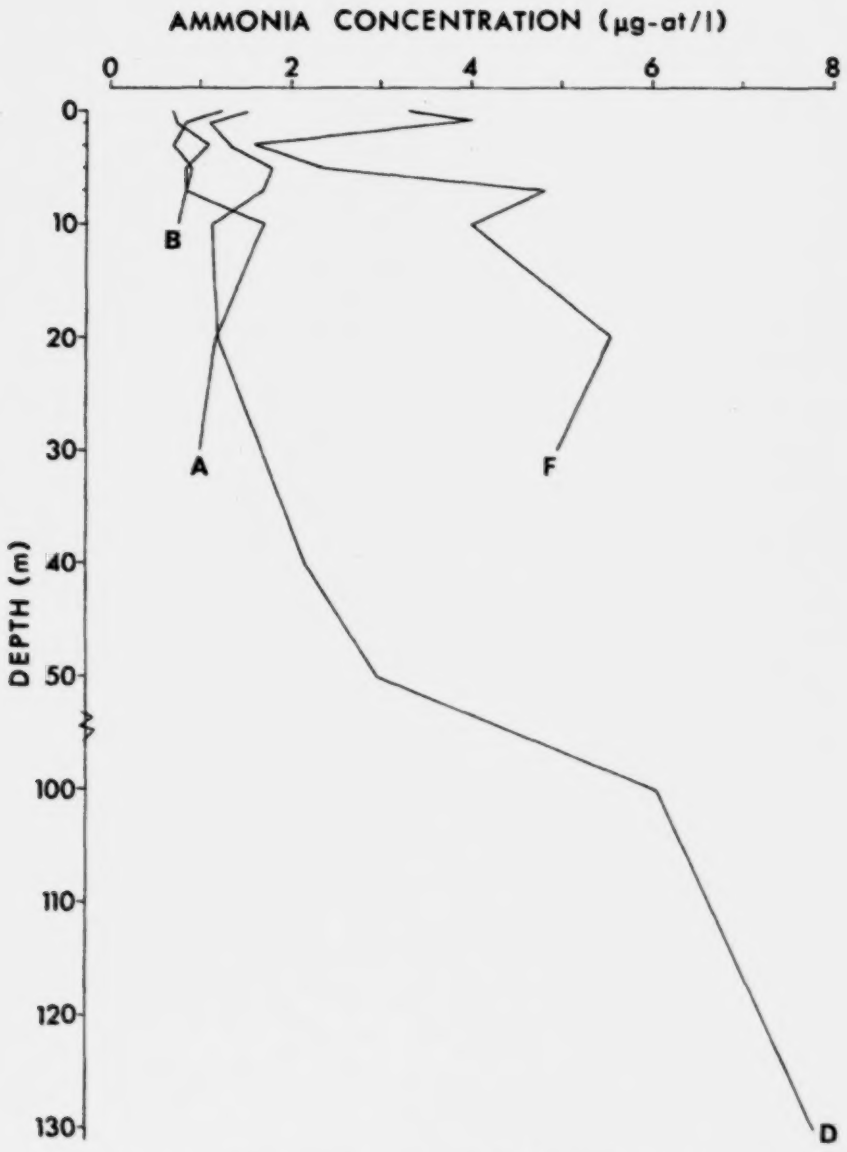

Fig. 1-8. Ammonia profiles. The curve for station A is the average for 2 observation dates.

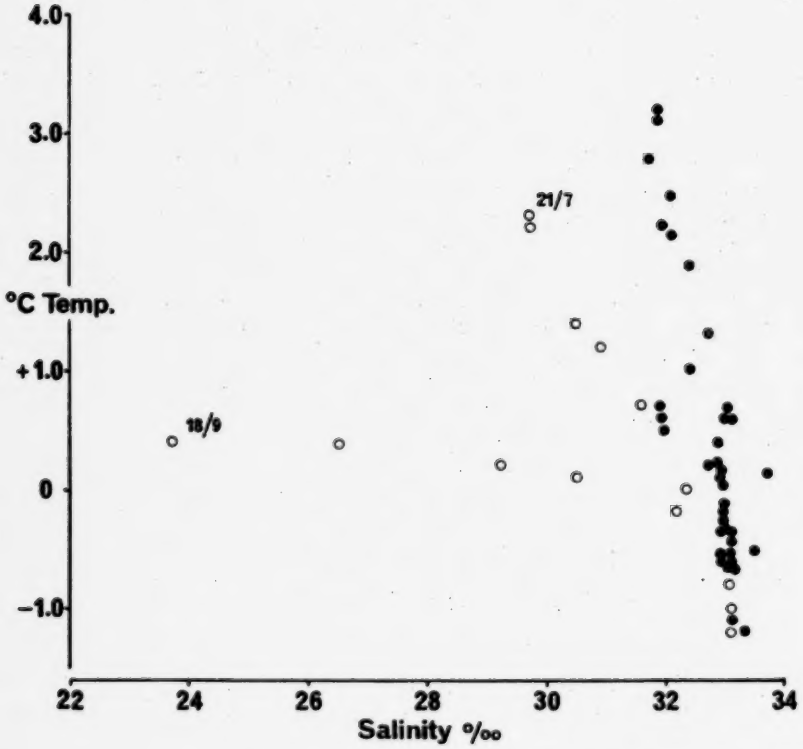

Fig. 1-9. T-S diagram for Brevoort and Cornelius Grinnell waters. Solid circles denote Brevoort stations, open circles Cornelius Grinnell stations.

station 79-A, where levels from near 2 to more than 3 µg-at/L prevailed near the surface on both August dates of sampling. This indicates a more rapid rate of replenishment of nitrate in surface waters at station A than was found at other locations. Ammonia (Fig. 1-8) was present everywhere, in greatest amounts at station 79-F-e in July.

Some of the variations in features at station 79-A on the two dates of occupation may be explained by winds. On 8 August (Table I-1), a fairly light southerly wind followed a much heavier southerly blow of the day before which evidently had blown relatively warm surface water of moderate salinity and oxygen content into the harbour. The second occupancy of station 79-A, on 13 August (Table I-2), was done under light northerly winds following a period of northerlies. Under those circumstances, the surface water was probably blown seaward and replaced by deeper, colder and more saline water with less dissolved oxygen. Changes in nutrients during the same time interval, especially silicate, may be partly explained in the same way.

Fig. 1-9 shows the temperature-salinity characteristics of the waters sampled. The black circles are of stations 79-A to 79-E, the open circles station 79-F, with the 2 dates of sampling at station 79-F separated. The Brevoort curves fall well within Dunbar's (1958) range for such arctic waters as Frobisher Bay and Hudson Bay. In the Brevoort data there is no sign of bottom water of Atlantic origin. From about 10 m down, T-S conditions at station F conform on both dates sampled with the Brevoort stations. Nearer the surface however, salinity is seen to be notably low and the T-S characteristics indicate local freshening. This, as was suggested above, is probably a consequence of the fresh water flow into Cornelius Grinnell Bay.

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2. Phytoplankton

S. I. C. Hsiao and R. Trucco

INTRODUCTION

Previous work on the phytoplankton of the eastern Canadian arctic and subarctic was limited to taxonomic studies of the phytoplankton flora (Cleve 1873, 1896, Bursa 1961a, b, 1971, Grøntved and Seidenfaden 1938, Seidenfaden 1947, Holmes 1956). Most dealt with records of diatoms and a small number with records of dinoflagellates and silicoflagellates. In some, information on size of standing stock was given only as relative abundance of the species encountered. In some investigations, nets were used for collecting or concentrating the samples, but more modern methods were also employed for estimating total phytoplankton abundance. The quantities recorded for standing stock in the eastern Canadian arctic and subarctic were given as cell numbers by Holmes (1956) and Bursa (1971) and/or as concentration of chlorophyll a (Grainger 1975, 1979).

Since chlorophyll a is essential for photosynthesis, its concentration is indicative of the potential rate of photosynthesis of phytoplankton population (Ryther and Yentsch 1957, 1958, Strickland 1960). The assimilation of carbon per unit of chlorophyll a (mg C/mg chlorophyll a per hour) is defined as assimilation number, and is widely used as a measure of vitality of phytoplankton (Strickland 1960), trophic state (McAllister et al. 1964), potential production (Lännergren 1976), and an estimation of phytoplankton population and growth (Eppley 1972). The assimilation number of phytoplankton varies with species composition (Söderstrom and Rex 1974, Lännergren 1976, Skjoldal and Lännergren 1978), cell size (Malone 1971, Taguchi 1976) and environmental factors such as light (Ryther and Yentsch 1957, Shimura and Ichimura 1973), temperature (Ichimura 1968, Eppley 1972, Jørgensen 1977) and nutrients (Curl and Small 1965, Lännergren 1976).

There are no quantitative studies of arctic marine phytoplankton for areas near Brevoort Island. The knowledge of the phytoplankton standing stock is of great importance for estimating the Brevoort biological productivity because the phytoplankton production is subsequently transferred to other components of the marine ecosytems: to herbivorous and carnivorous zooplankton, and then to fish, mammals and birds. In order to assess and compare future potential environmental changes resulting from oil and gas exploration and production activities, studies of standing stock, community structure,

species composition, quantitative distribution, primary production and assimilation number of phytoplankton photosynthesis in the waters adjacent to Brevoort Harbour and Cornelius Grinnell Bay were carried out under the present relatively undisturbed conditions.

MATERIALS AND METHODS

PHYTOPLANKTON COLLECTION, PRESERVATION AND IDENTIFICATION

Water samples containing natural populations of phytoplankton were collected with a 5.0-L van Dorn sampler from stations A to F in Brevoort Harbour and vicinity in the summer of 1979 during the cruise of M.V. *Calanus*. One hundred and twenty-five (125) mL of phytoplankton samples were preserved with 2.5 mL of 40% formaldehyde, neutralized with calcium carbonate in Boston round polyethylene bottles.

The preserved samples were quantitatively analyzed for species composition and standing stock. The techniques for preparing permanent slides of cleaned diatoms for species identification were described by Foy and Hsiao (1976). The phytoplankton were identified with the aid of a Wild M20 phase-contrast compound microscope. All samples were thoroughly shaken to suspend the cells. Subsamples of 25 mL were pipetted into a Zeiss 25 mL phytoplankton sedimentation chamber. The cells were allowed to settle for 12-24 hours, and were counted with the aid of a Zeiss inverted microscope at magnification of 400 times. The cells in an area equivalent to 216 microscope fields were counted. They were identified to species when possible, otherwise to higher taxonomic levels or groups. Total cell counts were used to estimate the standing stock of phytoplankton. Standing stock is given in cells per litre for each species. The results were tabulated. A "+" indicates that the phytoplankton were observed at some time during the analysis but not during the count, while a "-" indicates that phytoplankton were not observed at any stage of the analysis. Cell numbers given as "spp." may include individuals of species listed that could not be identified during the count and/or different species.

PRIMARY PRODUCTION

The measurement of primary production rate was made by means of carbon-14 technique. The production rates were determined on three occasions: two at station A and one at station D. The phytoplankton samples were collected simultaneously with the samples used for analyses of chlorophyll a, nutrients (ammonia, nitrite, nitrate, phosphate, and silicate), salinity, dissolved oxygen and total carbon dioxide, and for species composition and cell counts during the *Calanus* cruise to Brevoort Island. They were poured into clear and black serum bottles (500 mL) in duplicate. The bottles were closed with rubber stoppers (sleeve style) held on with brass wire. Three mL of sample were removed from each bottle with a hypodermic syringe. One mL of 10 μCi of $NaH^{14}CO_3$ (NEN Canada) was

injected into each bottle, and the contents thoroughly mixed by shaking. Two clear and two black bottles were placed in a plexiglass holder and lowered to the respective depths from which the samples were collected. They were incubated *in situ* for a maximum of 4 hours under natural sunlight and temperature. After incubation, the *in situ* labelled phytoplankton was killed by adding 2 mL of 40% neutral formaldehyde to each bottle. The labelled samples from each bottle were filtered in two equal portions through Millipore HA type 47-mm diameter filters under a vacuum of 380 mm Hg, and rinsed with 5 mL of 0.001 N HCl made with prefiltered natural seawater to remove inorganic radioactive bicarbonate solution retained on the filter. These filters were transferred to glass scintillation vials containing 20 mL of liquid scintillation cocktail, Aquasol-2. After the cruise, the scintillation vials were shipped back to Ste. Anne de Bellevue, and then counted for 10 min with a Nuclear Chicago Isocap 300 liquid scintillation system. After initial counting, 20 µL of carbon-14 labelled liquid toluene standard (4.0×10^5 dpm/mL) were added to each sample, and all vials were recounted. All counts were corrected for efficiency by the internal standardization method of Schindler (1966). The rates of photosynthetic production for both mg C/m^3 per hour and mg C/m^2 per hour were calculated employing the formulas listed in Hsiao et al. (1977).

ENVIRONMENTAL FACTORS

All the environmental factors were measured and recorded simultaneously with phytoplankton collections and *in situ* primary production experiments. The measurements of temperature, salinity, nutrients and dissolved oxygen were described in section 1 of this report. Chlorophyll a and total carbon dioxide were analyzed following Strickland and Parsons (1972). Solar radiation was measured twice at the beginning and end of carbon-14 uptake experiments with a Lambda light metre equipped with an underwater quantum sensor.

RESULTS

STANDING STOCK

The standing stock results, as measured by both chlorophyll a and cell counts are presented in Fig. 2-1 and Table 2-1. The highest count, 2190×10^3 cells/L was recorded at station B at 10 m; all other stations varied from 5 to 1435×10^3 cells/L. A major part of the standing stock was in the upper 20 m of the water column, and markedly decreased with increasing depth. The cell counts for the stations located in the waters adjacent to Brevoort Harbour, as expressed by numbers of cells/m^2, increased with increasing distance from shore up to station D, and then greatly decreased further south to station E (Table 2-2). The cell counts for station F-e located in the south of Cornelius Grinnell Bay were intermediate.

Table 2-1. Standing stock and community structure of phytoplankton in Brevoort Harbour and vicinity.

Depth m	Date	Station No.	Total phytoplankton Cells 1000/L	Diatoms: Centric %	Diatoms: Centric No.**	Diatoms: Pennate %	Diatoms: Pennate No.**	Flagellates %	Flagellates No.**	Dinoflagellates %	Dinoflagellates No.**	Chrysophytes %	Chrysophytes No.**	Blue-green algae %	Blue-green algae No.**
0	8 Aug. 79	A	1170	91.9	13	8.0	15	0.1	1	0	0	0	0	0	0
	6 Aug. 79	B	1367	84.7	12	15.1	8	0	0	0.2	2	0	0	0	0
	12 Aug. 79	C	622	98.4	10	1.4	4	0.2	1	0	0	0	0	0	0
	5 Aug. 79	D	558	77.8	9	21.8	7	0.2	1	0.2	1	0	0	0	0
	11 Aug. 79	E	26	53.9	5	0	0	34.6	1	11.5	3	0	0	0	0
	21 Jul. 79	F	1176	27.5	7	72.5	5	0	0	0	0	0	0	0	0
1	8 Aug. 79	A	355	94.9	14	4.8	9	0	0	0.3	1	0	0	0	0
	6 Aug. 79	B	917	89.9	13	10.0	7	0	0	0.1	1	0	0	0	0
	12 Aug. 79	C	551	97.6	10	2.2	5	0.2	1	0	0	0	0	0	0
	5 Aug. 79	D	216	84.3	9	14.8	5	0	0	0.9	2	0	0	0	0
	11 Aug. 79	E	34	64.7	6	0	0	32.4	2	2.9	1	0	0	0	0
	21 Jul. 79	F	1354	24.0	4	75.9	5	0.1	1	0	0	0	0	0	0
3	8 Aug. 79	A	754	89.5	9	10.3	7	0	0	0.1	1	0	0	0	0
	6 Aug. 79	B	893	89.1	12	10.6	9	0	0	0.3	2	0	0	0	0
	12 Aug. 79	C	404	93.1	13	6.9	2	0	0	0	0	0	0	0	0
	5 Aug. 79	D	402	95.5	10	4.0	5	0.5	1	0	0	0	0	0	0
	11 Aug. 79	E	245	88.2	9	10.2	3	1.2	2	0.4	1	0	0	0	0
	21 Aug. 79	F	714	21.3	5	78.7	6	0	0	0	0	0	0	0	0
5	8 Aug. 79	A	1277	93.2	14	6.7	14	0.1	1	0	0	0	0	0	0
	6 Aug. 79	B	1241	91.6	14	8.1	7	0	0	0.3	4	0	0	0	0
	12 Aug. 79	C	444	95.4	10	3.4	2	0.7	1	0.5	2	0	0	0	0
	5 Aug. 79	D	542	88.0	10	11.8	6	0	0	0.2	1	0	0	0	0
	11 Aug. 79	E	206	49.5	10	50.5	3	0	0	0	0	0	0	0	0
	21 Jul. 79	F	1114	28.6	8	71.1	9	0.1	1	0.2	1	0	0	0	0
7	8 Aug. 79	A	1236	88.7	16	11.2	8	0.1	1	0	0	0	0	0	0
	6 Aug. 79	B	746	93.4	12	6.1	7	0	0	0.5	3	0	0	0	0
	12 Aug. 79	C	445	88.1	9	11.0	2	0.2	1	0.7	1	0	0	0	0
	5 Aug. 79	D	732	88.9	10	10.3	6	0.1	1	0.7	2	0	0	0	0
	11 Aug. 79	E	351	70.6	10	28.5	5	0.3	1	0.6	2	0	0	0	0
	21 Jul. 79	F	1128	24.6	7	75.3	7	0.1	1	0	0	0	0	0	0
10	8 Aug. 79	A	1159	82.3	15	17.7	10	0	0	0	0	0	0	0	0
	6 Aug. 79	B	2190	93.5	12	6.2	9	0	0	0.3	2	0	0	0	0
	12 Aug. 79	C	390	79.7	10	15.0	4	1.3	1	3.1	4	0	0	0	0
	5 Aug. 79	D	475	89.7	10	8.8	4	1.1	2	0.4	2	0	0	0	0
	11 Aug. 79	E	192	78.2	10	19.8	5	1.0	1	1.0	2	0	0	0	0
	21 Jul. 79	F	1435	27.5	8	72.1	7	0.3	3	0.1	1	0	0	0	0

Table 2-1 (cont'd.)

Depth m	Date	Station No.	Total phytoplankton cells X1000/L	Diatoms: Centric %	Diatoms: Centric No.**	Diatoms: Pennate %	Diatoms: Pennate No.**	Flagellates %	Flagellates No.**	Dinoflagellates %	Dinoflagellates No.**	Chrysophytes %	Chrysophytes No.**	Blue-green algae %	Blue-green algae No.**
12	6 Aug. 79	B	1405	92.7	16	7.2	5	0	0	0.1	1	0	0	0	0
20	8 Aug. 79	A	991	92.8	14	7.0	10	0.1	1	0.1	1	0	0	0	0
	12 Aug. 79	C	430	89.8	10	8.8	5	0.2	1	1.2	3	0	0	0	0
	5 Aug. 79	D	449	76.8	11	23.2	5	0	0	0	0	0	0	0	0
	11 Aug. 79	E	172	86.1	10	8.7	5	3.5	2	1.7	3	0	0	0	0
	21 Jul. 79	F	94	22.3	5	65.9	3	3.3	3	3.2	1	5.3	1	0	0
30	8 Aug. 79	A	430	80.2	14	19.6	5	0.2	1	0	0	0	0	0	0
	12 Aug. 79	C	390	92.1	8	6.3	2	0.3	1	1.3	2	0	0	0	0
	5 Aug. 79	D	362	56.6	11	37.3	4	0.3	1	0.3	1	0	0	5.5	1
	11 Aug. 79	E	163	87.7	11	11.7	4	0	0	0.6	1	0	0	0	0
	21 Jul. 79	F	72	27.8	3	65.2	5	4.2	3	0	0	2.8	1	0	0
40	12 Aug. 79	C	326	95.0	9	2.8	3	0	0	2.2	3	0	0	0	0
	5 Aug. 79	D	299	77.9	9	20.4	5	0.7	1	1.0	2	0	0	0	0
	11 Aug. 79	E	181	91.7	8	8.3	5	0	0	0	0	0	0	0	0
50	12 Aug. 79	C	280	95.7	11	3.6	5	0	0	0.7	1	0	0	0	0
	5 Aug. 79	D	209	45.0	6	54.5	6	0	0	0.5	1	0	0	0	0
	11 Aug. 79	E	110	68.2	6	30.0	4	0.9	1	0.9	1	0	0	0	0
70	12 Aug. 79	C	213	88.7	11	9.5	6	0.9	1	0.9	2	0	0	0	0
100	5 Aug. 79	D	157	73.9	8	24.8	4	0	0	1.3	1	0	0	0	0
	11 Aug. 79	E	78	87.2	5	12.8	4	0	0	0	0	0	0	0	0
130	5 Aug. 79	D	91	40.7	5	52.7	2	1.1	1	0	0	0	0	5.5	1
200	11 Aug. 79	E	12	66.7	4	16.7	4	0	0	16.7	2	0	0	0	0
230	11 Aug. 79	E	5	40.0	4	40.0	3	0	0	20.0	1	0	0	0	0

* Percentage of total phytoplankton cells

** Number of species

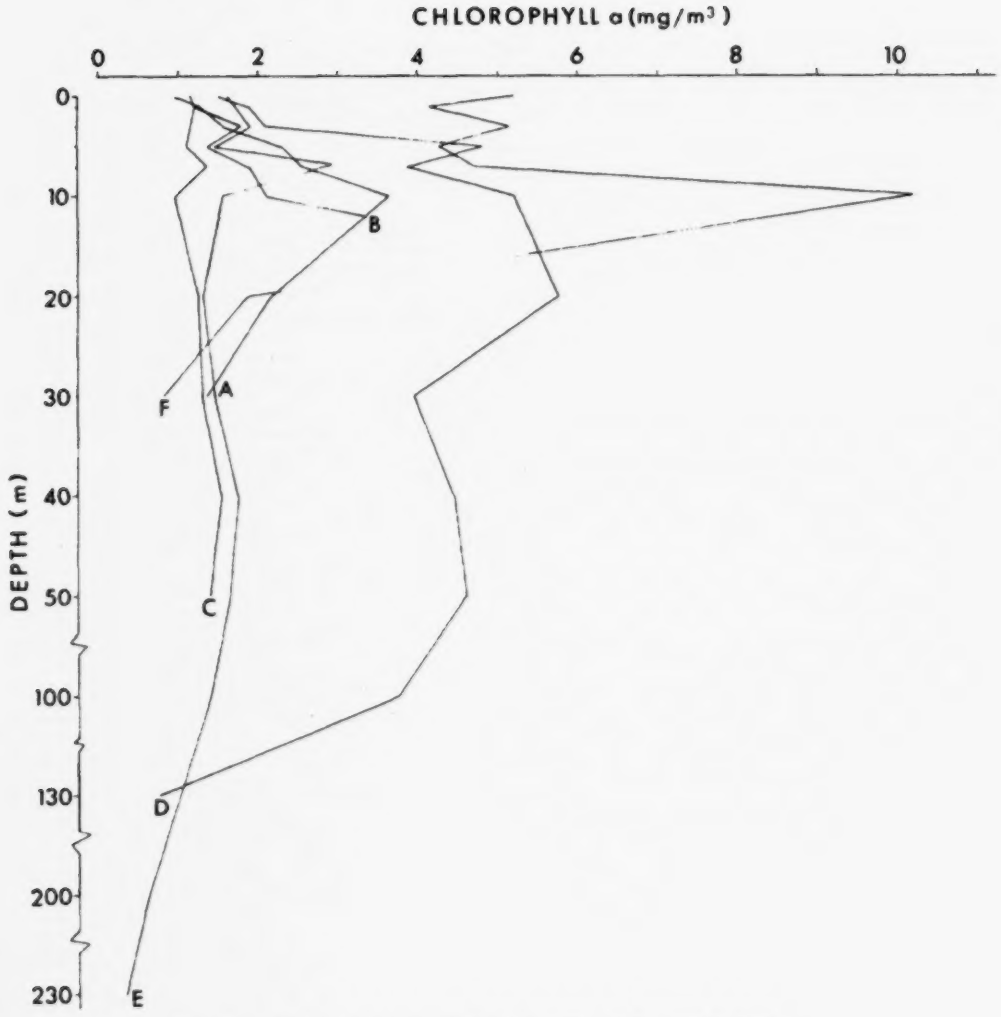

Fig. 2-1. Vertical distribution of chlorophyll a in Brevoort Harbour and vicinity.

Table 2-2. Standing stock, as expressed by cell counts and chlorophyll a, and primary production in the water column in Brevoort Harbour and vicinity.

Station No.	Date	Station depth sampled (m)	Depth of euphotic zone (m)	Cell counts ($X10^6$ cells/m^2)	Chorophyll a (mg/m^2)	Primary production (mgC/m^2/h)
B	6 Aug 79	12	ND	15,072	21.97	ND
A	8 Aug 79	30	30	27,863	59.76	92.18
	13 Aug 79	30	ND	ND	76.44	133.43
C	12 Aug 79	70	ND	24,271	93.33	ND
D	5 Aug 79	130	50	32,424	497.54	203.79
E	11 Aug 79	230	ND	18,257	271.73	ND
F-e	21 Jul 79	30	20	19,723	128.54	ND

ND = not determined

Chlorophyll a concentrations in Brevoort Harbour and vicinity ranged from 0.33 to 10.21 mg/m^3, about a 30-fold variability. Concentration was greatest in the upper 20 m, and progressively decreased with depth (Fig. 2-1). The maximum concentration generally occurred at 10 m or shallower. The highest concentration reached was 10.21 mg/m^3 at 10 m at station F-e. The quantities of chlorophyll a in the water column varied between 21.97 and 497.54 mg/m^2 (Table 2-2). They increased further away from shore south to station D, and then slightly decreased at station E. At station F-e the chlorophyll a content was intermediate.

COMMUNITY STRUCTURE

There were five groups (diatoms, flagellates*, dinoflagellates, chrysophytes and blue-green algae) of phytoplankton flora represented in the waters adjacent to Brevoort Harbour and Cornelius Grinnell Bay (Table 2-1). Larger communities were found in the upper 20 m, and decreased with increasing depth. Diatoms were usually dominant and the largest community, in terms of numbers of cells and species, in all stations and depths, followed by flagellates and dinoflagellates. Chrysophytes and blue-green algae were found only at station D at 30 and 130 m, and station F-e at 20 and 30 m respectively.

Centric diatoms accounted for more than 80% of the total population at all depths at stations A, B and C, while they were only 21.3 to 28.6% at station F-e (Table 2-1). At stations D and E, a greater percentage of centric diatoms were observed in the upper 40 m and 200 m respectively. In contrast, pennate diatoms were found as only 1.4 to 19.6% at stations A, B and C, while they represented more than 65% at all depths at station F-e. At stations D and E, pennate diatoms varied tremendously from 0 to 54.5% of the total population.

SPECIES COMPOSITION, DISTRIBUTION AND ABUNDANCE

Seventy-five species in 42 genera of phytoplankton were identified from Brevoort Harbour and vicinity, including 66 species of diatoms (26 centric and 40 pennate), 4 species each of flagellates and dinoflagellates and 1 species of chrysophytes (Table 2-3). The species composition and quantitative distribution are presented in Tables II-1 to II-6. All phytoplankton species were relatively more abundant in the upper 20 m. Below 20 m there was a distinct reduction both qualitatively and quantitatively in the phytoplankton populations.

The dominant genera of the diatoms were *Navicula* (11 species), *Nitzschia* (10 species), *Chaetoceros* (9 species), *Thalassiosira* (5 species), *Coscinodiscus* and *Cocconeis* (4 species each). The genera of other groups never became dominant. Fifteen dominant species of diatoms

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*Flagellates include *Cryptomonas* spp., *Chroomonas* spp., green and euglenoid flagellates.

Table 2-3. Phytoplankton genera and species from Brevoort Harbour and vicinity.

Bacillariophyta
  Centrales
    Actinocyclus Ehrenberg
      A. normani (Gregory) Hustedt
      A. subtilis (Gregory) Ralfs *in* Pritchard
    Bacterosira Gran
      B. fragilis (Gran) Gran
    Chaetoceros Ehrenberg
      C. borealis Bailey
      C. debilis Cleve
      C. decipiens Cleve
      C. fragilis Meunier
      C. furcellatus Bailey
      C. karianus Grunow *in* Cleve et Grunow
      C. septentrionalis Oestrup
      C. socialis Lauder
      C. wighami Brightwell
    Coscinodiscus Ehrenberg
      C. kuetzingii Schmidt
      C. lacustris var. *septentrionalis* (Grunow) Rattray
      C. polyacanthus Grunow *in* Cleve et Grunow
      C. radiatus Ehrenberg
    Coscinosira Gran
      C. polychorda (Gran) Gran
    Lauderia Cleve
      L. borealis Gran
    Leptocylindrus Cleve
      L. danicus Cleve
    Melosira Agardh
      M. arctica (Ehrenberg) Dickie *in* Pritchard
    Porosira Joergensen
      P. glacialis (Grunow) Joergensen
    Thalassiosira Cleve
      T. bioculatus (Grunow) Ostenfeld
      T. condensata Cleve
      T. decipiens (Grunow) Joergensen
      T. gravida Cleve
      T. nordenskioldii Cleve
  Pennales
    Achnanthes Bory
      A. brevipes Agardh
      A. taeniata Grunow *in* Cleve et Grunow
    Amphipleura Kuetzing
      A. rutilans (Trentepohl) Cleve

Table 2-3. (cont'd.)

Amphiprora Ehrenberg
A. gigantea var. *septentrionalis* (Grunow *in* Cleve et Grunow) Cleve
Cocconeis Ehrenberg
C. costata Gregory
C. placentula Ehrenberg
C. scutellum Ehrenberg
C. scutellum var. *stauroneiformis* Rabenhorst
Diploneis Ehrenberg
D. incurvata (Gregory) Cleve
D. smithii (Brébisson *in* Wm. Smith) Cleve
D. vacillans (Schmidt) Cleve
Gomphonema Agardh
G. exiguum Kuetzing
Grammatophora Ehrenberg
G. serpentina (Ralfs) Ehrenberg
Licmophora Agardh
L. gracilis (Ehrenberg) Grunow
Navicula Bory
N. directa (Wm. Smith) Ralfs *in* Pritchard
N. distans (Wm. Smith) Ralfs *in* Pritchard
N. kariana Grunow *in* Cleve et Grunow
N. pelagica Cleve
N. pygmaea Kuetzing
N. quadripedis Cleve-Euler
N. superba Cleve
N. transitans Cleve
N. transitans var. *derasa* (Grunow *in* Cleve et Grunow) Cleve
N. transitans var. *incudiformis* (Grunow *in* Cleve) Cleve
N. vanhoeffenii Gran
Nitzschia Hassall
N. brebissonii Wm. Smith
N. cylindrus (Grunow) Hasle
N. frigida Grunow *in* Cleve et Grunow
N. grunowii Hasle*
N. laevissima Grunow *in* Cleve et Moeller
N. lecointei Van Heurck
N. linearis (Agardh) Wm. Smith
N. longissima (Brébisson *in* Kuetzing) Grunow
N. polaris Grunow *in* Cleve et Moeller
N. seriata Cleve
Pinnularia Ehrenberg
P. quadratarea (Schmidt) Cleve
Pleurosigma Wm. Smith
P. cuspidatum (Cleve) H. Peragallo
Rhabdonema Kuetzing
R. minutum Kuetzing

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*as *Fragilariopsis oceanica* in following tables II-1 to II-6.

Table 2-3. (cont'd.)

Synedra Ehrenberg
S. tabulata (Agardh) Kuetzing
Tropidoneis Cleve
T. maxima (Gregory) Cleve

Chlorophyta
Carteria Diesing
Kirchneriella Schmidle
K. lunaris (Kirchner) Moebius
Pyramimonas Schmarda
P. grossii Parke
Tetraselmis Stein
T. suecica (Kylin) Butcher

Chrysophyta
Phaeocystis Lagerheim
P. pouchetii (Hariot) Lagerheim

Cryptophyta
Cryptomonas Ehrenberg
Chroomonas Hansgirg

Cyanophyta
Nostoc Vaucher

Euglenophyta
Euglena Ehrenberg
E. viridis Ehrenberg
Trachelomonas Ehrenberg

Pyrrophyta
Exuviella Cienkowski
E. marina Cienkowski
Gymnodinium Stein
G. gracile Bergh
Minuscula Lebour
M. bipes (Paulsen) Lebour
Oxytoxum Stein
Peridinium Ehrenberg
Prorocentrum Ehrenberg
P. micans Ehrenberg

occurred in the phytoplankton flora of Brevoort Harbour and vicinity. The most frequently encountered species in order of occurrence were: *Chaetoceros fragilis*, *C. furcellatus*, *C. socialis*, *Thalassiosira nordenskioldii*, *Nitzschia grunowii*, *Chaetoceros decipiens*, *C. wighami*, *Thalassiosira gravida*, *Nitzschia cylindrus*, *Detonula confervacea*, *Navicula pelagica*, *N. quadripedis*, *Thalassiosira decipiens*, *Achnanthes taeniata* and *Chaetoceros borealis*. The distribution of dominant species varied considerably from station to station, and with depth (Table 2-4). Generally, greater numbers of dominant species and cells were found in shallow waters, and mostly in nearshore areas.

The 12 species comprising the blooms (cell numbers $>10^5$/L) in Brevoort Harbour and vicinity were: *Chaetoceros decipiens*, *C. fragilis*, *C. furcellatus*, *C. socialis*, *C. wighami*, *Thalassiosira decipiens*, *T. gravida* and *T. nordenskioldii* (centric diatoms), *Nitzschia grunowii*, *N. cylindrus*, *Navicula pelagica* and *N. quadripedis* (pennate diatoms). Centric diatom blooms predominantly occurred in Brevoort Harbour (stations A and B) and extended south of the harbour (stations C, D and E), while pennate diatom blooms occurred almost exclusively in Cornelius Grinnell Bay (station F-e). Generally, greater numbers of species and cells were found at the stations with shallow waters and close to shore (Table 2-4).

A distinct multispecific bloom was observed at stations A, B, C, D and F-e, whereas a monospecific bloom occurred at station E, dominated by only one species, *Thalassiosira nordenskioldii* (Table 2-4). The blooms of *Chaetoceros fragilis* and *C. furcellatus* were found commonly at all stations except station F-e, while blooms of *Thalassiosira decipiens*, *Nitzschia cylindrus*, *Navicula pelagica* and *N. quadripedis* existed exclusively at station F-e. A bloom of *Nitzschia grunowii* was formed only at nearshore stations A, B and F-e. The most abundant and most obvious bloom was accounted for by *Chaetoceros socialis* with 79.8×10^4 cells/L at nearshore station B at depth of 10 m. A bloom of *Chaetoceros furcellatus* containing 10.2×10^4 cells/L was recorded in the deepest water at depth of 70 m at station C.

PRIMARY PRODUCTION

The vertical distribution of primary production in the waters adjacent to Brevoort Harbour during August 1979 is presented in Fig. 2-2. Generally, the production rates of station D were slightly greater than those at station A. They ranged between a minimum of 1.40 mg C/m^3 per hour at 40 m and a maximum of 7.98 mg C/m^3 per hour at 5 m, whereas at station A they varied from 0.66 mg C/m^3 per hour at 30 m to 7.60 mg C/m^3 per hour at 10 m. At station A, the production rates on 8 August varied from 0.66 to 6.71 mg C/m^3 per hour compared with a range of 0.98 to 7.60 mg C/m^3 per hour on 13 August. For both occasions at station A, the highest levels of production rates were found at 10 m.

The rate of production under 1 m^2 of the water column at station D was almost twice as much as that at station A (Table 2-2). At station A, the rate on 13 August was 45% greater than that on 8 August.

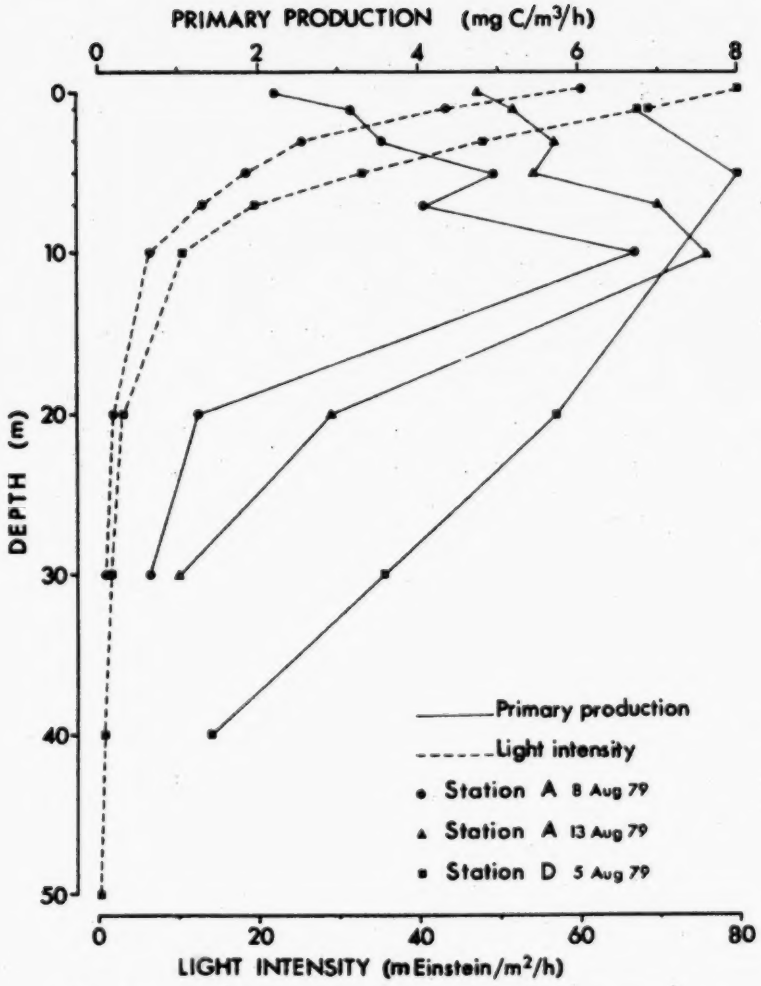

Fig. 2-2. Vertical distribution of primary production in relation to light intensity in the waters adjacent to Brevoort Harbour.

Table 2-4. The distribution of dominant species and blooms of phytoplankton in Brevoort Harbour and vicinity.

Station	Dominant species	Cell numbers $X10^4/L$	Depth (m) at which species was dominant
A	*Chaetoceros borealis*	5.4	0
	C. decipiens	9.6-10.8	5, 7*
	C. fragilis	13.2-41.4	0, 1, 3, 5, 7, 10, 20, 30
	C. furcellatus	6.0-30.6	0, 3, 5, 7, 10, 20, 30
	C. socialis	6.6-10.2	5, 7, 10
	C. wighami	5.4-19.2	0, 1, 3, 5, 7, 20
	Thalassiosira gravida	5.5-10.7	7, 10
	T. nordenskioldii	6.0- 9.9	5, 10
	Nitzschia grunowii	5.5-10.5	7, 10
B	*Chaetoceros decipiens*	7.8-28.9	0, 1, 10, 12
	C. fragilis	15.6-52.8	0, 1, 3, 5, 7, 10, 12
	C. furcellatus	7.5-18.6	0, 1, 3, 5, 7, 10, 12
	C. socialis	16.8-79.8	0, 1, 3, 5, 7, 10, 12
	C. wighami	5.1- 6.9	1, 3, 7
	Detonula confervacea	5.5	10
	Thalassiosira gravida	6.4-10.3	0, 12
	T. nordenskioldii	8.7-10.2	5, 12
	Nitzschia cylindrus	8.0	0
	N. grunowii	5.5-11.2	0, 1, 5, 10
C	*Chaetoceros decipiens*	5.4	0
	C. fragilis	7.3-36.6	0, 1, 3, 5, 7, 10, 20, 30, 40, 50
	C. furcellatus	6.1-15.8	0, 1, 3, 5, 7, 20, 30, 40, 50, 70
	C. socialis	6.0- 7.2	0, 3
D	*Chaetoceros fragilis*	7.1-32.6	5, 7, 10, 20, 40
	C. furcellatus	6.6-17.7	0, 1, 3, 5, 7, 10, 20, 30
	C. socialis	5.1-10.9	0, 3, 5, 7, 10
	C. wighami	6.6	0

Table 2-4. (cont'd.)

Station	Dominant species	Cell numbers $X10^4/L$	Depth (m) at which species was dominant
E	*Chaetoceros fragilis*	6.0	7
	C. furcellatus	6.5- 6.6	30, 40
	Thalassiosira nordenskioldii	5.3-11.3	3, 7, 10, 20
	Nitzschia grunowii	6.0- 9.6	5, 7
F	*Detonula confervacea*	5.1- 6.0	1, 3
	Thalassiosira decipiens	6.4-10.3	0, 1, 5, 7, 10
	T. gravida	5.9	10
	T. nordenskioldii	5.1- 5.2	0, 1
	Achnanthes taeniata	8.0	7
	Navicula pelagica	14.0-41.1	0, 1, 3, 5, 7, 10
	N. quadripedis	7.1-33.1	0, 1, 3, 5
	Nitzschia cylindrus	10.0-29.0	0, 1, 3, 5, 7, 10
	N. grunowii	5.9-38.4	0, 1, 3, 5, 7, 10

* Underlined depth indicates occurrence of bloom.

ASSIMILATION NUMBERS

Assimilation numbers for phytoplankton photosynthesis followed the patterns of primary production and chlorophyll a. They ranged from 0.31 mg C/mg chlorophyll a per hour at 40 m to 3.52 mg C/mg chlorophyll a per hour at 1 m at station D, while station A varied between 0.44 mg C/mg chlorophyll a per hour at 30 m and 3.80 mg C/mg chlorophyll a per hour at the surface (Fig. 2-3). The assimilation numbers of station D were slightly higher than those of station A when compared at similar depths. At station A, the numbers on 13 August were greater than those on 8 August.

The number was greatest generally near the surface, the region of highest light intensity in this study. It decreased markedly with increasing depth, and decreased considerably with decreasing temperature, even below zero (Fig. 2-4). It did not correlate with salinity (Fig. 2-5), dissolved oxygen (Fig. 2-6) or nutrients (Figs. 2-7 to 2-11).

DISCUSSION

Cell counts (numbers of cells/m^2) agreed well with chlorophyll a (mg/m^2) for the measurement of standing stock in the water column of Brevoort Harbour and vicinity. Both cell counts and chlorophyll a increased with increasing distance from shore south to station D, and then decreased further south to station E. They were intermediate at station F-e. Their maxima appeared in the upper 20 m, and markedly decreased with increasing depth. This good relationship was attributed primarily to the fact that the standing stock was greatly dominated by the diatom community. Hickman (1973) found that cell counts tended to over-emphasize small but numerically abundant phytoplankton, and under-emphasize numerically less abundant but large-sized phytoplankton. Chlorophyll a measurements also have limitations which vary with availability of nutrients (Ketchum et al. 1958, Meeks 1974), duration and intensity of light reaching the cells (Ryther 1956, Yentsch and Scagel 1958, Meeks 1974), water temperature (Bogorad 1962, Meeks 1974), quantitative composition of phytoplankton community (Malone 1971), cell sizes and their physiological states (Bogorad 1962, Meeks 1974) and diurnal fluctuation (Yentsch and Ryther 1957, Yentsch and Scagel 1958). However, although subject to variations, standing stock was validated only when both cell counts and chlorophyll a were concurrently determined within the known community structures.

Seventy-five species of phytoplankton were identified and classified into 5 major groups of phytoplankton flora. Diatoms were the most important representatives of the phytoplankton, followed by flagellates and dinoflagellates. Chrysophytes and blue-green algae occurred only sporadically and almost always in low numbers. Species composition, distribution and community structure of phytoplankton may change radically with different seasons. Reid (1975), based on monthly investigation over 25 years' (from 1948 to 1973) continuous plankton

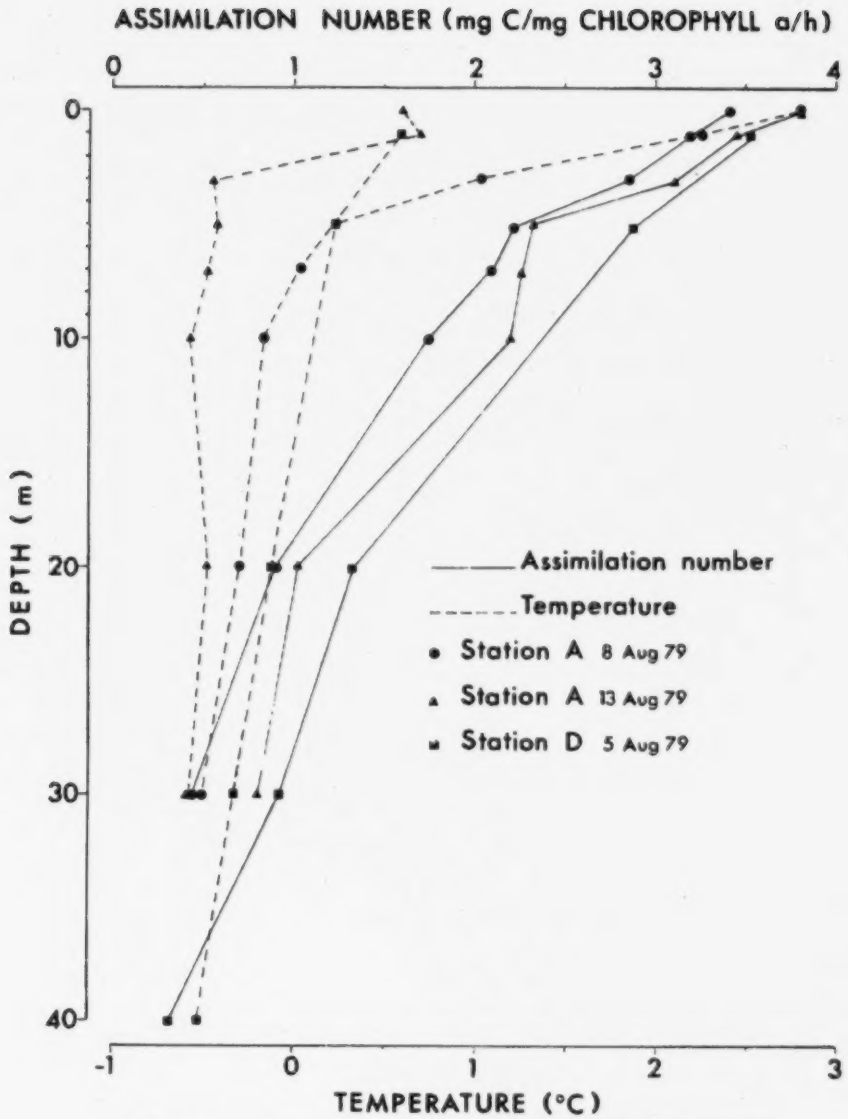

Fig. 2-3. Vertical distribution of assimilation number in relation to temperature in the waters adjacent to Brevoort Harbour.

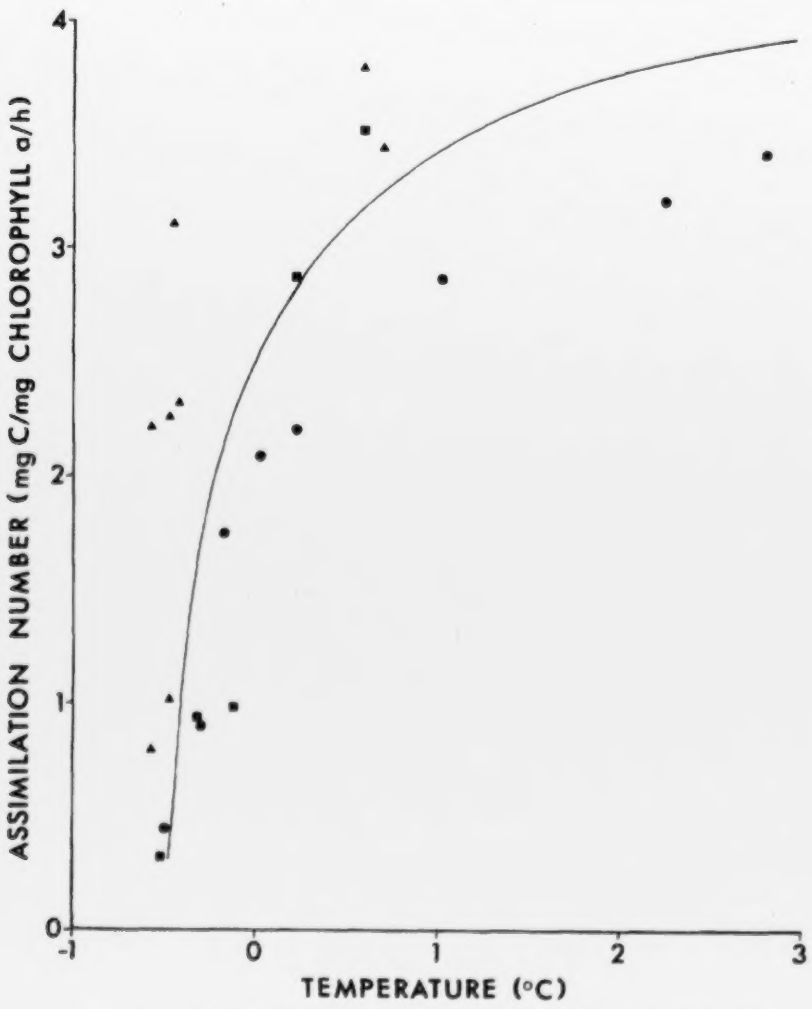

Fig. 2-4. The relationship between assimilation number and temperature in the waters adjacent to Brevoort Harbour.

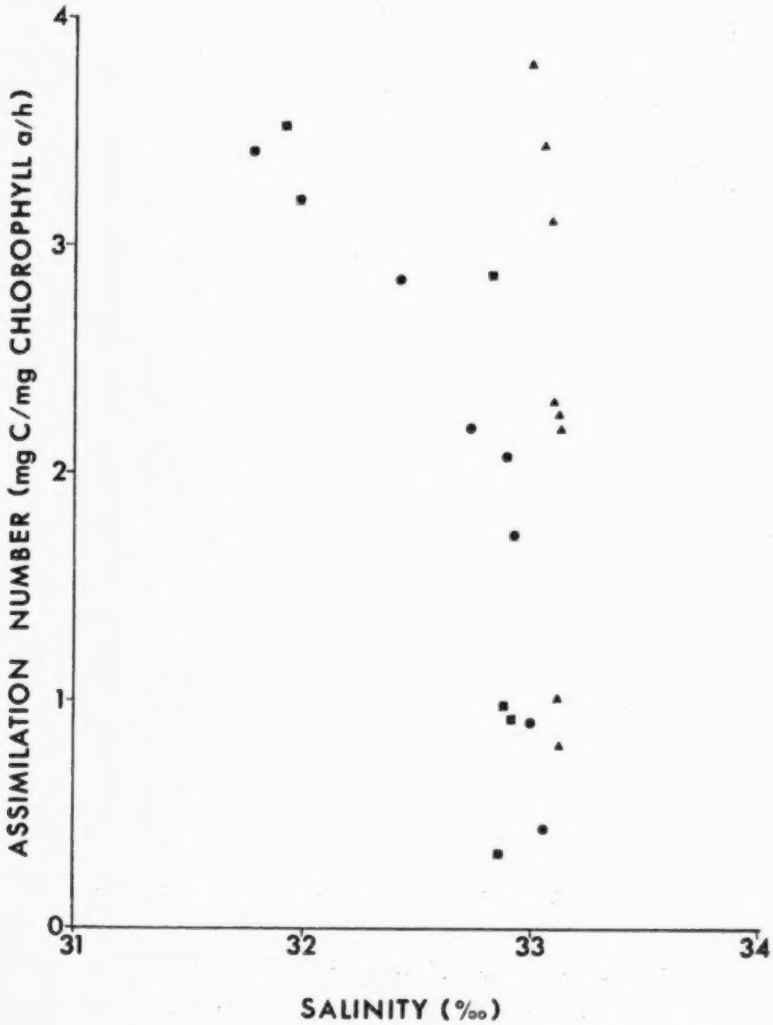

Fig. 2-5. Variations in assimilation numbers with salinity in the waters adjacent to Brevoort Harbour.

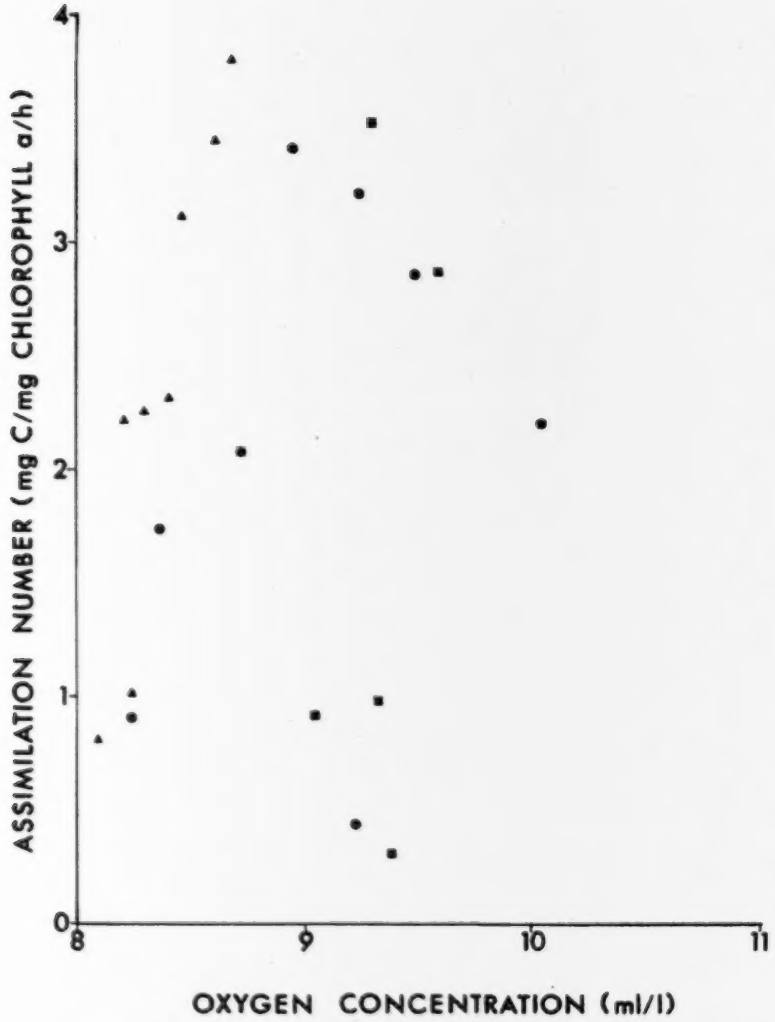

Fig. 2-6. Variations in assimilation numbers with dissolved oxygen in the waters adjacent to Brevoort Harbour.

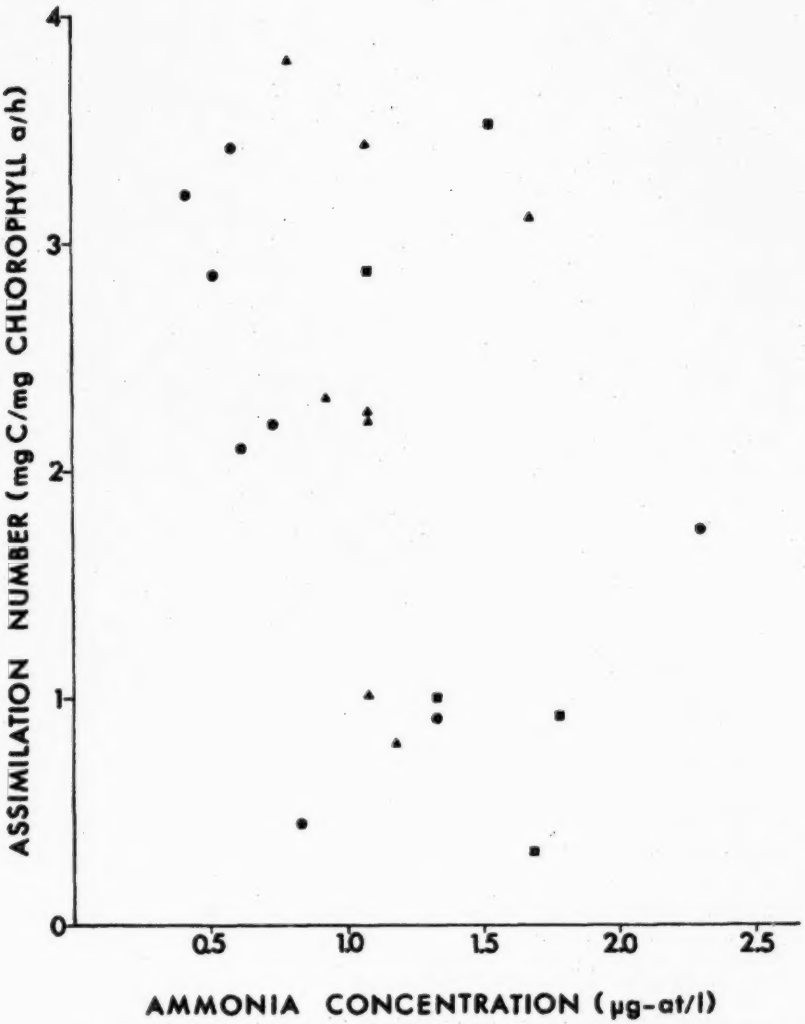

Fig. 2-7. Variations in assimilation numbers with ammonia concentrations in the waters adjacent to Brevoort Harbour.

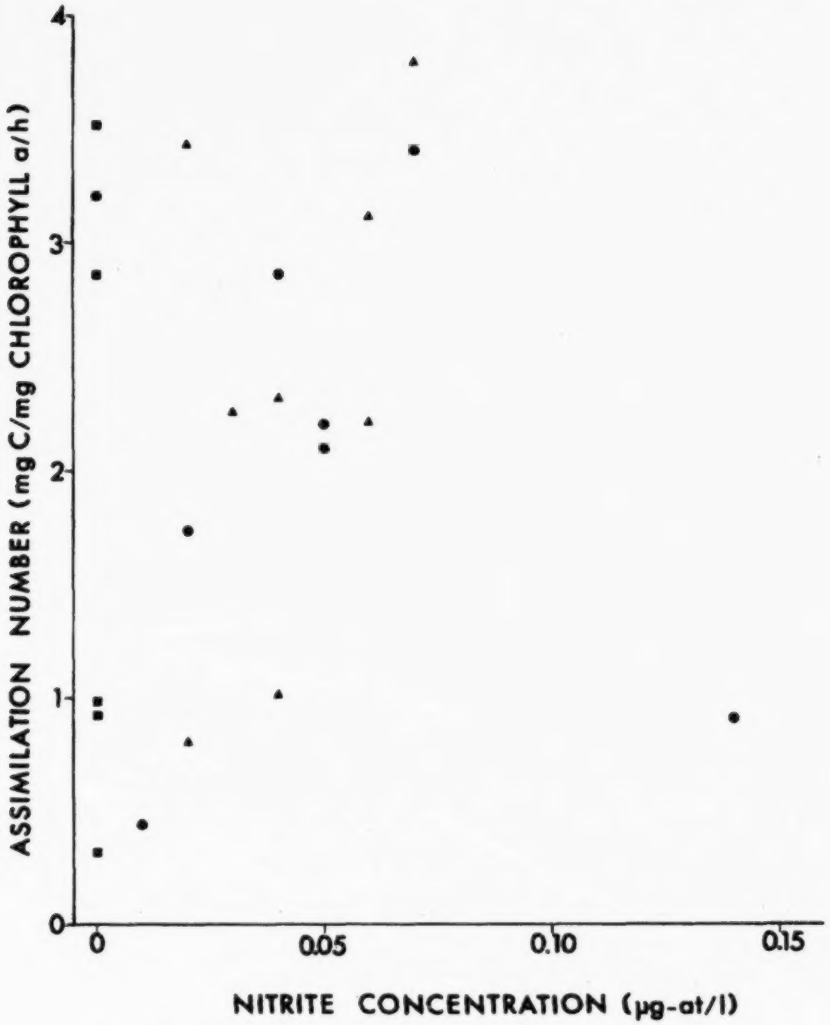

Fig. 2-8. Variations in assimilation numbers with nitrite concentrations in the waters adjacent to Brevoort Harbour.

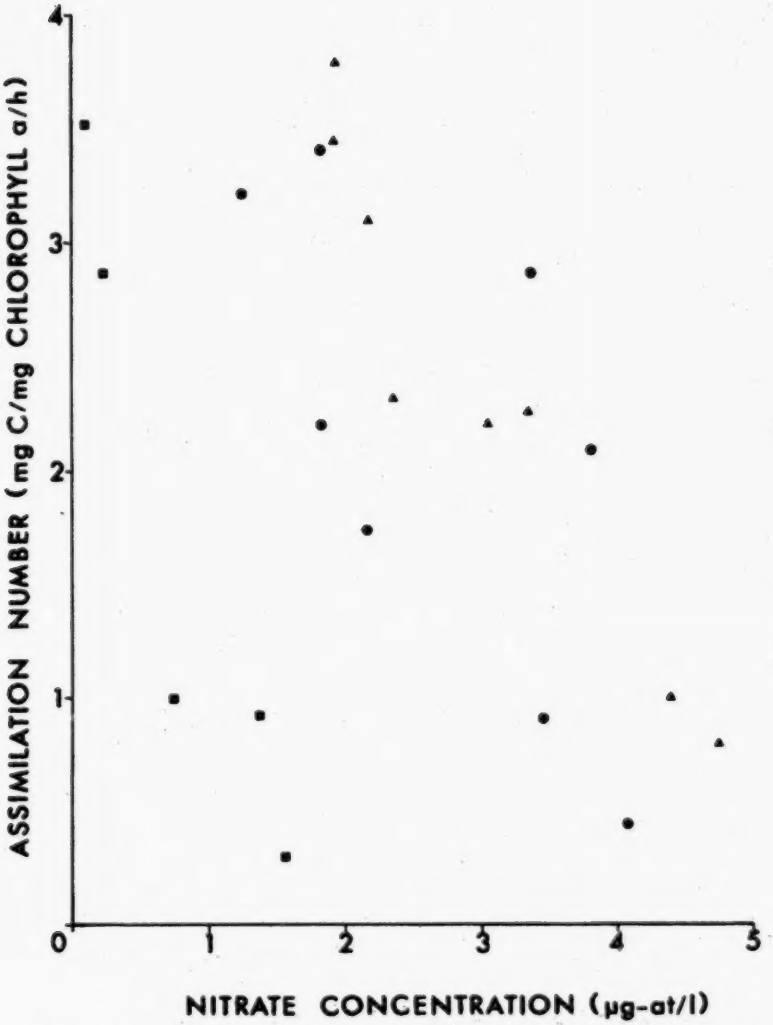

Fig. 2-9. Variations in assimilation numbers with nitrate concentrations in the waters adjacent to Brevoort Harbour.

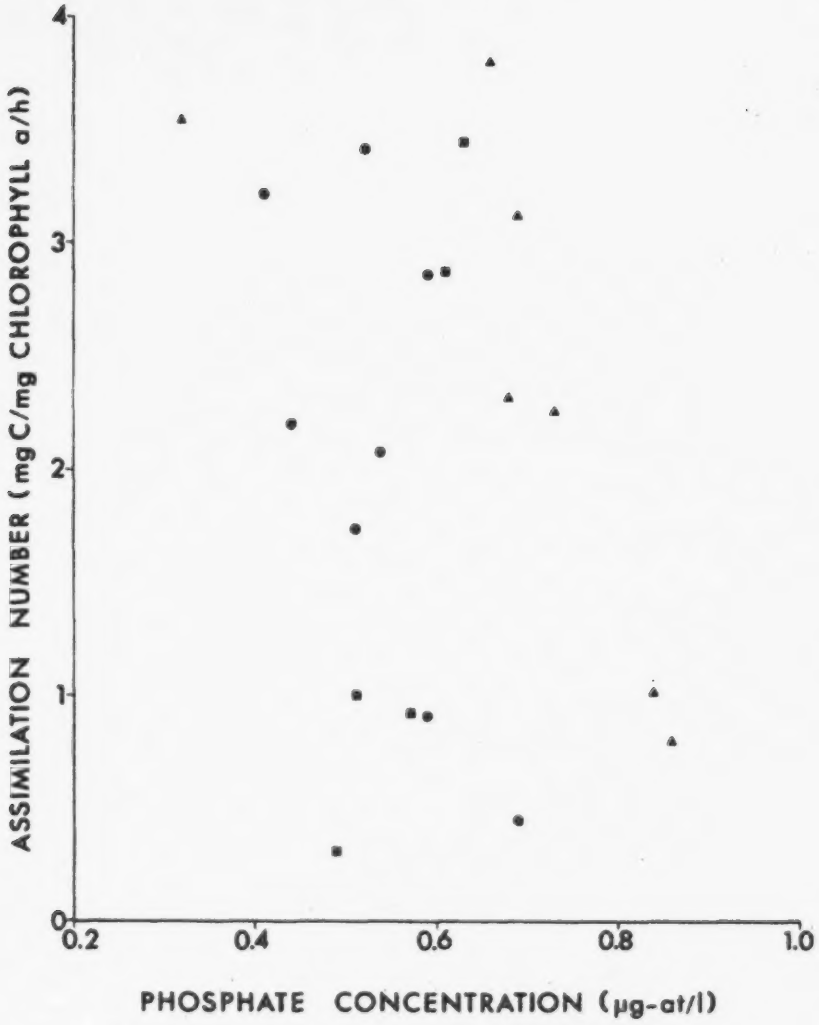

Fig. 2-10. Variations in assimilation numbers with phosphate concentrations in the waters adjacent to Brevoort Harbour.

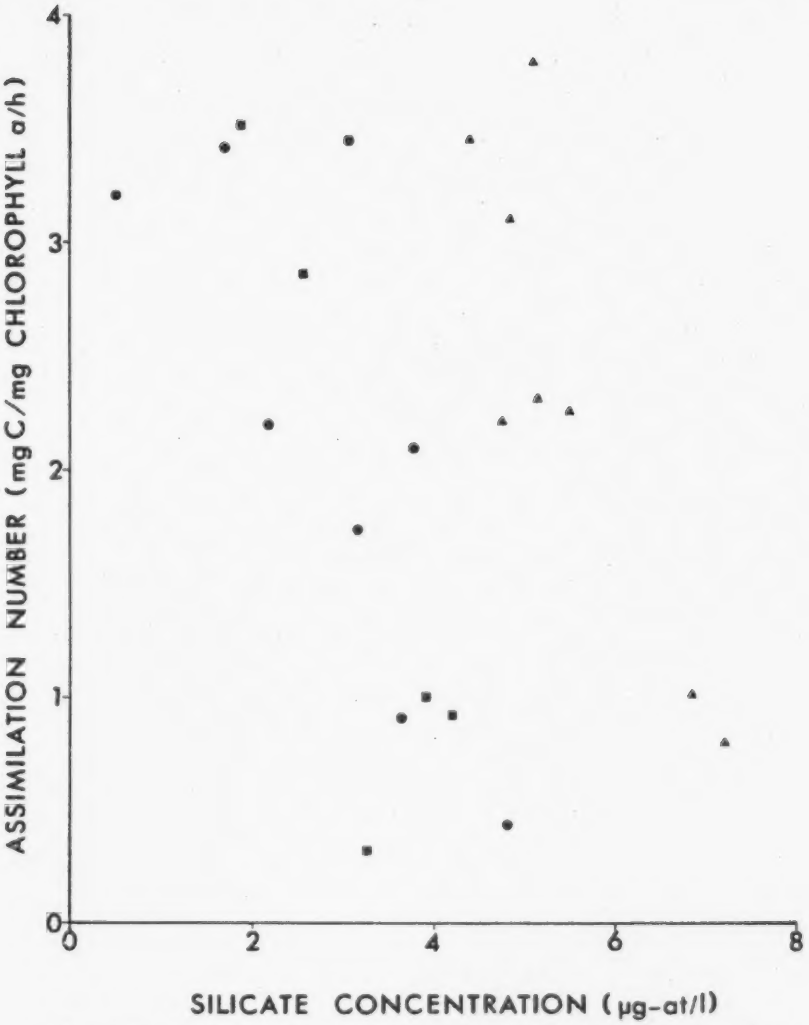

Fig. 2-11. Variations in assimilation numbers with silicate concentrations in the waters adjacent to Brevoort Harbour.

records of North Sea phytoplankton, found large-scale changes in phytoplankton communities which were characterized by a marked decline in diatom populations, a possible increase in microflagellate abundance, and a decline in the zooplankton biomass. These changes were possibly caused by the presence of persistent pollutants such as petroleum hydrocarbons in the North Sea (Fisher 1976). Different components of the phytoplankton have been shown to have different sensitivity to oil (Dunstan et al. 1975, Pulich et al. 1974, Winters et al. 1976). Hsiao (1978) showed that diatoms were more sensitive than other groups of phytoplankton. Thus, the quantitative analysis and species composition of phytoplankton will be of considerable value in studying the effect of oil spills. During summer as the diatoms constituted the major components of primary food supply in the waters adjacent to Brevoort Harbour and Cornelius Grinnell Bay, data on their occurrence, distribution patterns and community composition are of great importance in assessing possible effects of oil in the waters around Brevoort Island.

The reasons for more centric diatoms occurring in the waters adjacent to Brevoort Harbour (stations A to E) and for more pennate diatoms occurring in Cornelius Grinnell Bay (station F-e) are still unknown. Further studies are needed.

Simultaneous measurements of ammonia, nitrite, nitrate, phosphate and silicate at stations A and D showed that nutrients were sufficient to support plant growth even during the period of the blooms (see Fig.1-5 to 1-8). Nutrients therefore were unlikely to be limiting at those localities, although they may have been at others. During summer, although a thermocline was often well established (see Fig. 1-2) which prevented nutrients from deeper nutrient-rich deep water replenishing the euphotic zone, the phytoplankton productivity was distinctly higher than that in tropical and subtropical seas. Such high productivity was probably induced by the depth of the thermocline being shallower than the compensation depth, which kept a large part of the phytoplankton community within the euphotic zone (Taniguchi 1972).

In terms of cell counts (numbers/m^2), chlorophyll a (mg/m^2) and primary production (mg C/m^2 per hour) of the water column, station D was considerably more productive than station A. This probably was due to a greater water transparency at station D, permitting more solar radiation to penetrate into the water than at station A. The depths of the euphotic zone were about 30 m and 50 m for stations A and D, respectively. Light intensity at similar depths was about 34-89% greater at station D than at station A (Fig. 2-2). In contrast, cell counts (number/L) were 50% higher at station A than at station D. Station A is located in Brevoort Harbour with shallow waters (35-37 m) where prevailing winds transport surface water seaward, and upwelling of nutrient-rich bottom water occurs along the coasts. Such hydrographic conditions are extremely favourable for phytoplankton growth (Sverdrup and Allen 1939) largely because the phytoplankton receives a supply of nutrient rich water and is prevented from sinking. However, Paasch (1960) found that small species had more cells per unit of chlorophyll than large ones, while conversely large species

had more cell volume per unit of chlorophyll than small ones. Further, the chlorophyll content of phytoplankton is known to vary inter- and intra-specifically within quite wide limits. In order to normalize these variations, the assimilation number has been used. However, the assimilation number is regulated by environmental factors such as light intensity and seawater temperature, because nutrients, salinity and dissolved oxygen are not limiting in the study area.

The assimilation numbers of natural phytoplankton populations in Brevoort Harbour and adjacent waters ranged from the minimum of 0.31 at 40 m at station D to the maximum of 3.80 at the surface water of station A. The number decreased with increasing depth and light intensity diminished exponentially. These values were higher than those in Frobisher Bay (0-1.96) found by Grainger (1979), but comparable to the 3.30 for Davis Strait (Steeman Nielsen and Hansen 1959), and to the 0.40 to 3.50 for the Antarctic summer at Bransfield and Gerlache straits (Mandelli and Burkholder 1966). Curl and Small (1965) found that the assimilation number was greatest at the optimal light intensity for photosynthesis, and became smaller either at a lower or higher light intensity. During this study the highest intensity of solar radiation in the Brevoort area was about 69 m Einstein/m^2 per hour which might just reach light saturation (Fig. 2-12).

Seawater temperature in this study was in the range of -0.58 to 2.80°C. Assimilation numbers of 2.21 at 10 m and 3.41 for surface waters were found respectively at the lowest and highest temperatures. This 50% difference is probably due to temperature changes. Diminishing light intensity with depth may also be a factor. The assimilation numbers at subzero levels of seawater temperature remain relatively high in the upper 20 m as compared with those below. This clearly demonstrates that during the summer season under light saturation condition the assimilation numbers are mainly controlled by temperature in the upper part of the euphotic zone, and in the lower part by light intensity. This confirms the findings of Steemann Nielsen (1961), Ichimura (1967) and Mandelli et al. (1970) in which assimilation numbers increase with increasing temperature under conditions of optimal light intensity and no shortage of nutrients for photosynthesis. Bunt and Lee (1970) showed that production was commonly limited by the amount of light available at stations with snow cover, and by temperature at ice-free stations at McMurdo Sound in the Antarctic.

During summer, phytoplankton productivity in Brevoort Harbour and adjacent waters reaches a maximum as the bloom occurs. It coincides with the formation of a thermocline that increases the water's stability. This thermal stability is destroyed again in the autumn by cooling, tidal currents and wind mixing of surface water. During winter the waters are mixed to considerable depths and surface waters are enriched by the admixture of nutrient-rich deep water. This vertical mixing is the major process to replenish nutrients in the euphotic zone (Ryther 1963). When vertical mixing greatly exceeds the depth of the euphotic zone, productivity becomes limited (Riley 1942, Sverdrup 1953). It can be expected that productivity would reach a minimum with the development of ice and snow cover.

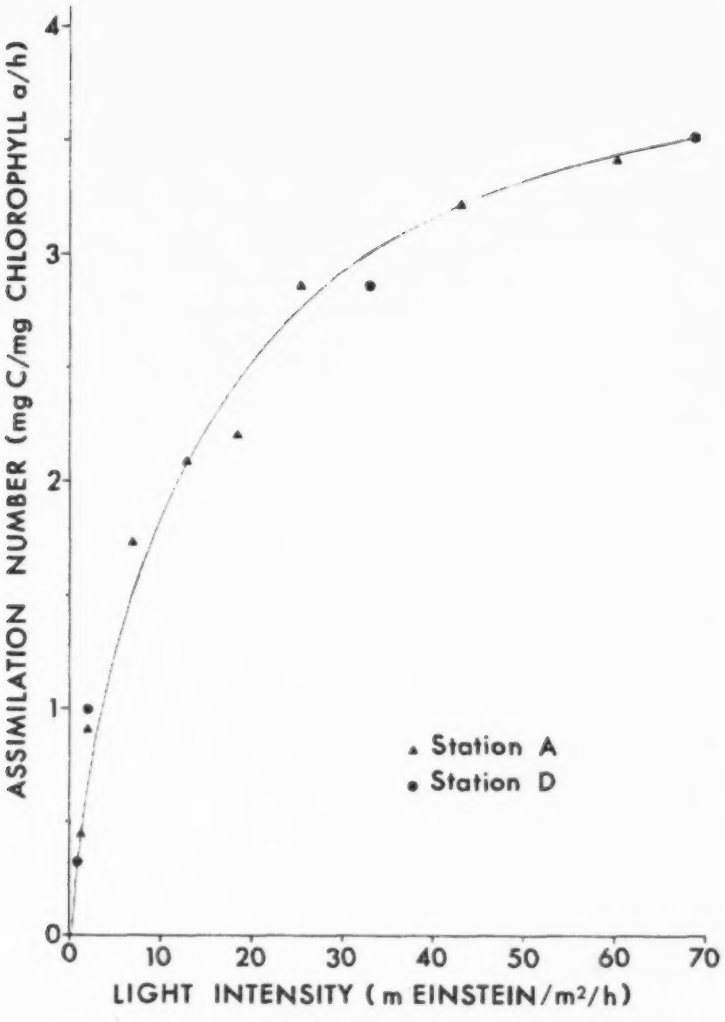

Fig. 2-12. The relationship between assimilation number and light intensity in the waters adjacent to Brevoort Harbour.

SUMMARY

Standing stock, community structure, species composition, distribution, *in situ* primary production and photosynthetic assimilation numbers of natural populations of phytoplankton in the waters adjacent to Brevoort Harbour (stations A, B, C, D, and E) and Cornelius Grinnell Bay (station F-e) were studied between late July and mid-August 1979.

Standing stock, as measured by both cell counts and chlorophyll a, exhibited ranges of 5-2190 X 10^3 cells/L and 0.33-5.74 mg chlorophyll a/m^3 in the waters adjacent to Brevoort Harbour, and 72-1435 X 10^3 cells/L and 0.81-10.21 mg chlorophyll a/m^3 in Cornelius Grinnell Bay. Greatest concentrations occurred in the upper 20 m, and gradually decreased with depth in both regions. The standing stock, as expressed by cell counts and chlorophyll a per square metre, was 15,072-32,424 X 10^6 cells/m^2 and 21.97-497.54 mg chlorophyll a/m^2 in the waters adjacent to Brevoort Harbour, and 19,723 X 10^6 cells/m^2 and 128.54 mg chlorophyll a/m^2 in Cornelius Grinnell Bay. Both cell counts and chlorophyll a increased with increasing distance from shore southward to station D, and decreased farther south to station E. They were intermediate at station F-e.

The phytoplankton community consisted mostly of diatoms at all stations and depths, with centric diatoms dominating in the Brevoort Harbour area, and pennate diatoms in Cornelius Grinnell Bay. Flagellates and dinoflagellates occurred in very low numbers except in the surface water at the offshore station E. Chrysophytes and blue-green algae were observed occasionally at stations F-e and D respectively. Larger communities, in terms of numbers of cells and species, were found in the upper 20 m, and decreased with increasing depth.

Seventy-five species of phytoplankton were identified, including 66 species of diatoms, 4 species each of flagellates and dinoflagellates, and 1 species of chrysophytes. Greater numbers of dominant species and cells were distributed largely in shallow waters, mostly near shore. A distinct multispecific bloom was observed at the nearshore stations (A, B, C, D and F), while a monospecific bloom occurred at the offshore station (E). The most abundant and obvious bloom was accounted for by *Chaetoceros socialis* with 79.8 X 10^4 cells/L at nearshore station B at a depth of 10 m. A bloom of *Chaetoceros furcellatus* containing 10.2 X 10^4 cells/L occurred in the deepest water (70 m) at station C.

In situ primary production at station D was slightly greater than at Station A: 1.40-7.98 mg C/m^3 per hour and 203.79 mg C/m^2 per hour for station D, compared with 0.66-7.60 mg C/m^3 per hour and 92.18-133.43 mg C/m^2 per hour for station A. The assimilation numbers followed the patterns of primary production and chlorophyll a. They ranged from 0.31 mg C/mg chlorophyll a per hour at 40 m to 3.52 mg C/mg chlorophyll a per hour at 1 m at station D, and from 0.44 mg C/mg chlorophyll a per hour at 30 m to 3.80 mg C/mg chlorophyll a per hour at the surface at station A. They were highest at the surface, and decreased markedly with increasing depth and decreasing temperature. No correlation was found with salinity, dissolved oxygen or nutrients.

The most important factors governing primary productivity in the nutrient-sufficient waters appeared to be the combined effects of light and temperature. It was concluded that productivity was controlled during the study period by temperature in the upper, light-saturated part of the euphotic zone, and by light in the lower part of the euphotic zone and deeper, where temperature remained constant.

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3. Zooplankton biology

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OBJECTIVES

The objectives of this part of the study were to present a quantitative description of the zooplankton over the maximum time period possible, to show the major factors influencing the summer plankton (time of occurrence with relation to available plant food, growth and development cycles, predators), to make special reference to the uniquely arctic ice fauna which includes a part of the zooplankton population which appears to find food or refuge in or on the ice, and to place the zooplankton in the local food web, to show its role in the maintenance of fishes and other vertebrate groups.

METHODS

Four plankton nets were used in the collection of zooplankton samples; fine nets were conical, with 30-cm diameter openings and meshes of 0.073 and 0.233 mm, coarse nets conical, with 1-mm mesh and openings of 1 metre and 50 cm. Nets were hauled vertically, obliquely or horizontally. Vertical net speeds were between 0.5 and 1 m per second. Oblique hauls were made by lowering the net to a few metres above the bottom, moving the vessel ahead at about 4 knots (or 2 m per second) for 2 minutes while the net rose gradually towards the surface, then hauling in with the vessel still underway at a winch speed of about 0.5 m per second. Horizontal hauls were usually made at about 2 m per second.

Counts of zooplankton were made on the fine net vertical hauls on the basis of a calculated volume of water filtered based on total filtering efficiency of the nets. This assumption is based on observations made with similar gear elsewhere (unpublished observations) which showed virtually complete filtering except in the presence of high plant concentrations. Numbers expressed therefore are minimal; some may be low. Estimations of numbers in the oblique and horizontal hauls must be considered as being less reliable, on the basis of far greater difficulty encountered in determining the amount of water filtered by the net and in assessing the catching effectiveness of the net, particularly of the potentially more elusive organisms.

Table 3-1. Zooplankton species found in this study.

	Recorded here	Formerly recorded from Frobisher Bay	Formerly recorded from Davis Strait
Cnidaria			
Aeginopsis laurenti Brandt	+	+	+
Aglantha digitale (O. F. Müller)	+	+	+
Bougainvillia superciliaris (Agassiz)	+	+	+
Dimophyes arctica (Chun)	+		+
Euphysa flammea (Linko)	+	+	+
Hybocodon prolifer Agassiz	+	+	+
Sarsia princeps (Haeckel)	+	+	+
Sarsia tubulosa (M. Sars)	+	+	+
Ctenophora			
Beroe cucumis Fabricius	+	+	+
Mertensia ovum (Fabricius)	+	+	+
Mollusca			
Clione limacina (Phipps)	+	+	+
Spiratella helicina (Phipps)	+	+	+
Polychaeta			
Autolytus cornutus Agassiz	+	+	+
Autolytus prismaticus (O. F. Müller)	+	+	+
Autolytus prolifer (O. F. Müller)	+	+	+
Nereis pelagica Linné	+		+
Scalibregma inflatum Rathke	+	+	+
Sphaerosyllis erinaceus Claparede	+	+	+
Syllis cornuta Rathke	+	+	+
Tomopteridae	+		+
polychaete larvae, unidentified	+	+	+
Ostracoda			
Conchoecia elegans G. O. Sars	+		+
Philomedes globosus (Lilljeborg)	+	+	+
Calanoida			
Acartia longiremis (Lilljeborg)	+	+	+
Calanus finmarchicus (Gunnerus)	+	+	+
Calanus glacialis Yaschnov	+	+	+
Calanus hyperboreus Krøyer	+	+	+
Chiridius obtusifrons G. O. Sars	+		+
Euchaeta glacialis Hansen	+	+	+
Heterorhabdus norvegicus (Boeck)	+		+
Metridia longa (Lubbock)	+	+	+
Microcalanus pygmaeus (G. O. Sars)	+	+	+
Pseudocalanus sp.	+	+	+
copepod nauplii, unidentified	+	+	+
copepod eggs, unidentified	+	+	+
Cyclopoida			
Oithona similis Claus	+	+	+
Oncaea borealis G. O. Sars	+	+	+
Oncaea minuta Giesbrecht	+		
Cyclopina schneideri Scott	+	+	

Table 3-1. Continued.

	Recorded here	Formerly recorded from Frobisher Bay	Davis Strait
Harpacticoida			
Ectinosoma sp.	+		+
Harpacticus superflexus Willey	+	+	
Harpacticus uniremis Krøyer	+		
Microsetella norvegica (Boeck)	+		+
Parathalestris jacksoni (Scott)	+		
Tisbe furcata (Baird)	+	+	+
Monstrilloida			
Monstrilla dubia Scott	+		
Monstrilla helgolandica Claus	+		
Monstrilla sp.	+	+	
Cirripedia			
nauplii, unidentified	+	+	+
Mysidacea			
Mysis mixta Lilljeborg	+	+	+
Mysis oculata (Fabricius)	+	+	+
Mysis sp.	+		+
Isopoda			
Dajus mysidis Krøyer	+		+
epicarids, unidentified	+	+	
Gammaridea			
Anonyx nugax (Phipps)	+	+	+
Apherusa glacialis (Hansen)	+	+	+
Halirages megalops (Bucholtz)	+	+	+
Ischyrocerus anguipes Krøyer	+	+	+
Onisimus glacialis (G. O. Sars)	+	+	+
Parapleustes bicuspis (Krøyer)	+		+
Westwoodilla brevicalar (Goës)	+	+	+
Hyperiidea			
Hyperia galba (Montagu)	+	+	+
Parathemisto abyssorum Boeck	+	+	+
Parathemisto libellula (Lichtenstein)	+	+	+
Euphausiacea			
Thysanoessa inermis (Krøyer)	+	+	+
Thysanoessa raschii (M. Sars)	+	+	+
Decapoda			
Eualus gaimardi (H. Milne Edwards)	+	+	+
Pagurus pubescens Krøyer	+	+	+
Sabinea septemcarinata (Sabine)	+	+	+
Spirontocaris phippsi (Krøyer)	+	+	+
Chaetognatha			
Eukrohnia hamata (Mobius)	+	+	+
Sagitta elegans Verrill	+	+	+
Sagitta maxima (Conant)	+		+
Chordata			
Oikopleura vanhoeffeni Lohmann	+	+	+
	74	57	65

Estimates of vertical distribution of organisms recorded from the fine nets were made on the basis of successive hauls from various depths to the surface, the numbers of animals per unit volume in the deeper layers being calculated by subtraction of shallow hauls from deeper ones.

Weights of organisms were determined from direct weighing or they were taken from the literature (Bogorov 1959; Pertsova 1967).

Ice fauna was collected from ice samples from which all attached animals were removed before melting, leaving only the organisms within the ice. Subsequent melting therefore revealed animals which had been within and not simply on the surface of the ice.

Stations where the plankton originated are described in the first section of this report (see Table 1-1).

RETROSPECTION

There is a large body of literature available on the zooplankton of Davis Strait and adjacent waters, but remarkably little of it refers specifically to the cold west side of the strait. The warmer east side of Davis Strait is the subject of most of the published work.

Perhaps the first systematic zooplankton collected along the west side of Davis Strait, and not far from the Brevoort site, was Dunbar's (1942a, 1942b). This was preceded by the *Godthaab* voyage of 1928, but this study barely touched the Baffin Island coast, concentrating its work farther to the east. Results were discussed in summary form by Kramp (1963). Canadian ice-breaker collections made in the late 1950s were used for a study on the distribution of *Calanus* species off east Baffin Island (Grainger 1961, 1963). The copepod *Pseudocalanus* of Winton Bay, only a few kilometres from Brevoort Island, was investigated by Woods (1969). Canadian arctic zooplankton was reviewed by Shih et al. (1971), and reference made in that work to the Davis Strait records of the years preceding. Pavshtiks (1968, 1972) discussed the Davis Strait zooplankton at length and referred to material from near the Baffin coast. A 2-year, year-round survey of the zooplankton of Frobisher Bay was reported by Grainger (1971), and a survey of southeast Baffin by MacLaren Atlantic (1977).

RESULTS

SPECIES COMPOSITION AND STANDING STOCK

We record here 74 species of zooplankton from the Brevoort and Cornelius Grinnell Bay areas (Table 3-1). Most of the species (65) were already known from Davis Strait, and in fact the 9 species formerly unreported belong to 3 groups of copepods, the cyclopoids, harpacticoids and monstrilloids, all frequently overlooked in general zooplankton surveys.

Species composition and numbers at the various stations sampled are shown in Tables III-1 to III-5 (fine nets) and III-6 to III-11 (coarse nets).

Standing stocks, expressed as mg per m^3 (wet weight) cover a fairly wide range. Fine net hauls, made vertically through most of the water column at various stations, gave values from 321 mg (wet) per m^3 (0-35 m, station 79-F) to 61 mg per m^3 (0-30 m, station 79-A). This fraction of the zooplankton represents mainly the herbivores of the plankton. The coarse net hauls, made horizontally and therefore sampling the plankton in a different way, collected what may be considered in general terms as the carnivorous fraction. (It must be emphasized that this categorization of the yields of the 2 nets is made in a very approximate way only.) Coarse net hauls showed standing stocks ranging from 32 mg (wet) to less than 1 mg per m^3, by day. Night hauls took coarse plankton to as great a concentration as 400 mg (wet) per m^3 at a depth of 5 m.

A limited amount of information may be extracted from the present data on development rates of some of the zooplankton species in this material. *Calanus glacialis* at station 79-F in July showed the apparent beginnings of development of the new generation of copepodites of the year. Stage V copepodites dominated, with fewer stage IV and stage VI (adult) females, and stage I was present with only a trace of stages II and III. About 3 weeks later, at stations 79-A, C, D and E, stage I dominated strongly and adult females were rare. Comparatively little change was noted a month later at station 79-F, except that stages II, III and IV were stronger and adult females had almost disappeared. This suggests less than a full development cycle being completed in a single year, and the likelihood that an annual cycle similar to what has been shown elsewhere in arctic waters (Cairns 1967) prevails, with a second summer of growth being required to complete the development of at least part of the population.

Pseudocalanus showed a clear dominance of adult females, and an abundance of adult males, and other stages down to copepodite IV (with a trace of stage I) at station 79-F in July. By early August, stage I outnumbered all others, and adult males were comparatively rare. This situation remained into September. *Pseudocalanus* too appears to undergo a typical 1+ year arctic cycle in these waters.

VERTICAL DISTRIBUTION

In addition to horizontal distribution patterns, the animals and plants of the sea exhibit the vertical distribution arrangements made possible by the 3-dimensional nature of the oceans. The study of vertical distribution and its daily and seasonal changes has been extensive (Vinogradov 1970, Bougis 1976).

In this study, we examined both day and night vertical distribution at 2 stations. Some indications of daytime vertical distribution of coarse net material taken in August in the Brevoort area is shown in Table 3-2.

Table 3-2. Vertical occurrence of large zooplankters in the Brevoort Island area during daylight. Numbers per 10 m^3.

Depth (m)	5	15	20-25	40-45	75	115	140
Number of hauls	4	4	5	2	1	1	1
Aeginopsis laurenti	+	0.3	0.2	0.1	0	+	+
Aglantha digitale	0.6	0.8	0.6	1.3	0.7	0.8	1.4
Decapod larvae	0	0.1	0.2	+	+	0.2	+
Parathemisto libellula	0.5	0.9	0.4	0.5	0.5	0.1	0.3
P. abyssorum	+	+	+	0.4	0.8	0.8	0.4
Eukrohnia hamata	0.2	0.7	0.4	0.3	0.2	1.0	1.4
Sagitta elegans	+	0.4	0.6	0.1	0.2	0.3	0.3
Mysis oculata	+	0.2	1.1	0	0	0	0

In the table, 18 collections from various depths illustrate variations in depth distribution in certain of the larger zooplankton species. Nothing very notable is seen regarding the medusae *Aeginopsis* and *Aglantha*. Decapod larvae appear as well to occur fairly evenly through the depth range. There is a suggestion that the amphipod *Parathemisto libellula* may show a preference for water nearer the surface; certainly it appears to differ in its depth from *P. abyssorum*, here a relatively deep species. The chaetognath *Eukrohnia hamata* may do better in deeper water than its relative *Sagitta elegans*. The mysid *Mysis oculata* was apparently restricted in this material (by day) to near-shore, near-bottom waters.

Wet weights of the coarse plankton fraction by day at offshore station 79-E were: 6 mg (wet) per m^3 at 20 m, 10 mg at 40 m, 8 mg at 75 m and 13 mg at 130-150 m, showing the largest stock occupying the deepest water. That was certainly the demonstrated situation amongst the fine net zooplankton. Again at station 79-E, wet weights were: 10 mg (wet) per m^3 at 0-30 m, 1 mg at 30-50 m, 56 mg at 50-100 m, and 133 mg at 100-200 m. Medusae, euphausiids and chaetognaths preferred the deeper offshore waters as shown by the coarse net. Within the finer material, *Calanus finmarchicus*, older *C. hyperboreus*, *Chiridius obtusifrons*, *Euchaeta glacialis* and *Heterorhabdus norvegicus* were best represented in the deeper waters.

At the shallower stations, nearer shore (79-A and 79-F), material was collected to demonstrate both day and night distribution. By this means, diurnal vertical migration was quite clearly shown to occur in several species.

Zooplankton was collected in both fine and coarse nets, at about mid-day and near mid-night, that is in daylight and in darkness, from 3 depths at station 79-A in August. The results of these hauls are shown in Table 3-3. Some of the data in the table appear again in Fig. 3-1. Polychaete larvae occurred from top to bottom, but mainly in the middle depth by day. At night they congregated near the surface. The copepods as a group seem to have undergone only slight upward movement at night. *Calanus glacialis* however clearly underwent a considerable vertical movement between day and night and *Metridia longa* did too. Copepod and cirripede nauplii demonstrated dramatic vertical movements. *Oikopleura* and *Pseudocalanus* apparently showed some tendency towards vertical movement. Other larvae and *Calanus hyperboreus* showed none. Medusae, ctenophores, pteropods, hyperiid amphipods, decapods and chaetognaths gave no evidence at all of vertical movements. Among the coarse net material only *Mysis oculata* appeared to undergo diurnal vertical migration, and it did so to a very marked degree.

Expressions of this diurnal shift in biomass are shown at the bottom of Fig. 3-1 as mg (wet) per cubic metre. There is a clear biomass shift mainly from the middle to the top water layer in the fine net material, and from the bottom to the top in the coarse fraction.

The major calanoid copepods are shown in Table 3-4. *Calanus glacialis* undergoes nighttime upward movement in all stages, perhaps most conspicuously

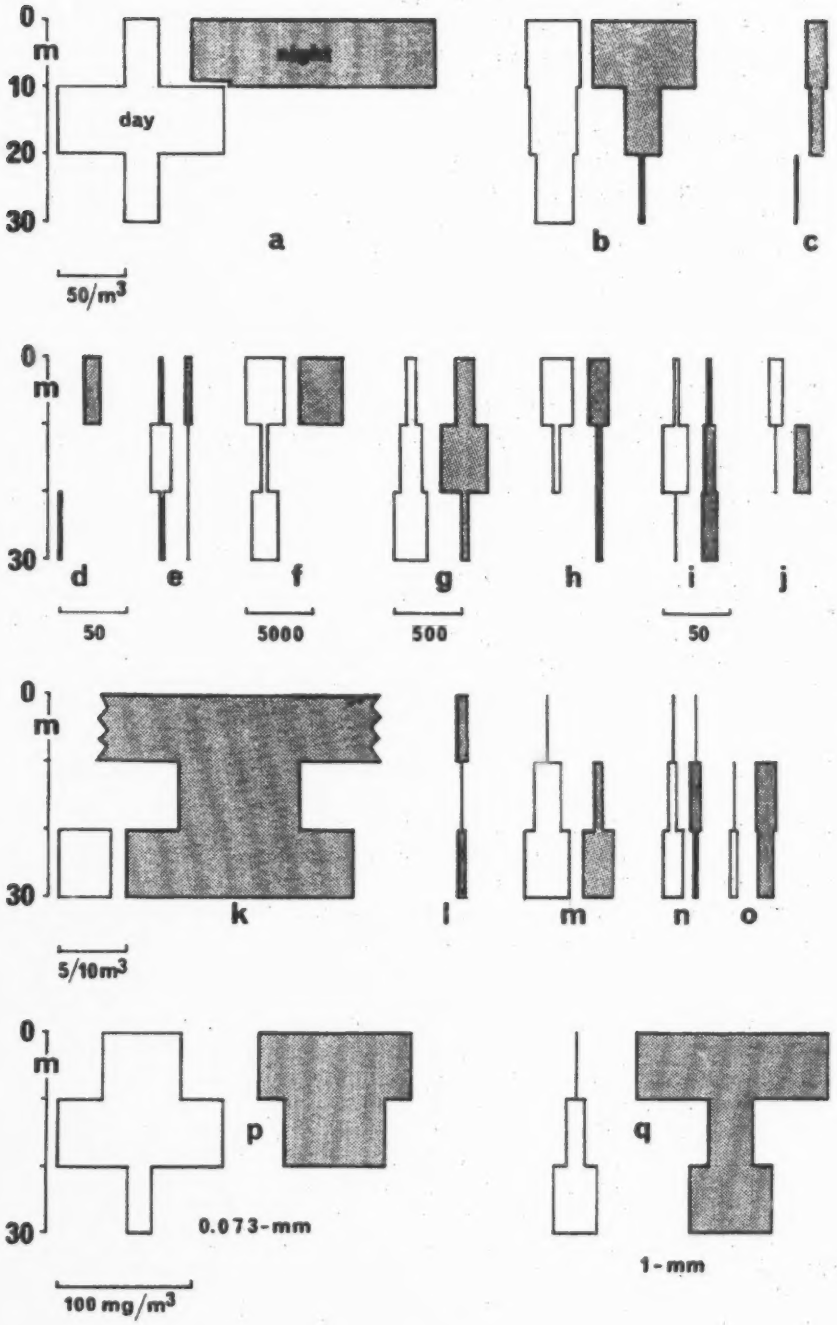
Table 3-3. Vertical distribution of zooplankton groups, day and night, at station A, 13 Aug. 1979.

0.073-mm mesh nets	Day			Night		
numbers per 1 m^3	0-10 m	10-20 m	20-30 m	0-10 m	10-20 m	20-30 m
polychaete larvae	23	125	23	183	0	0
copepod copepodites	796	433	451	696	405	102
copepod nauplii	2800	502	2080	3737	0	0
cirripede nauplii	0	0	2	11	0	0
euphausiid nauplii	11	1	0	0	11	0
other larvae	217	35	0	149	13	21
eggs	1063	331	0	743	239	515
1-mm mesh nets						
numbers per 10 m^3	2-3 m	13-16 m	25-30 m	1-3 m	15 m	25 m
medusae	+	2.2	3.3	0	0.8	2.4
ctenophores	+	+	+	0	0	+
pteropods	0.3	0.8	0.3	0	0.4	0.3
hyperiids	+	0.9	1.5	+	0.8	0.5
mysids	0	0	3.8	55	9.1	18
decapods	0	+	0.2	0	0.9	0.6
chaetognaths	+	0.5	1.1	0	1.4	1.2

Table 3-4. Vertical distribution of dominant copepods, day and night, station A, 13 Aug. 1979. Numbers per m^3.

		Day			Night		
		0-10 m	10-20 m	20-30 m	0-10 m	10-20 m	20-30 m
C. glacialis	F	0	0	3.0	0	4.2	0
	V	2.9	4.3	9.9	4.3	18	0
	IV	0	0	0	0	1.4	2.8
	III	0	7.2	0	1.4	2.8	0
	II	10	1.4	3.0	13	1.2	0
	I	27	25	11	57	0	0
C. hyperboreus	F	0	2.8	0	0	0	1.5
	V	0	1.4	0	1.4	0	1.4
	IV	0	1.4	0.1	1.4	1.4	0
	III	1.4	11	0	2.9	7.1	4.4
	II	0	1.4	0.1	0	0	3.0
	I	0	1.4	0	0	0	0
M. longa	M	0	0	3.0	1.4	2.8	0
	F	0	0	0	7.1	0	0
	V	0	0	0	5.8	2.8	0
Pseudocalanus	M	1.4	0	1.6	2.9	0	0
	F	24	10	0	2.9	16	14
	V	0	11	11	0	23	0
	IV	22	0	35	0	11	0
	III	11	47	11	0	138	0
	II	0	34	56	46	74	18
	I	23	57	127	46	92	0

Fig. 3-1. Vertical distribution of zooplankton, day and night, at station A, 13 Aug. Quantities in a to j are given as individuals per m^3 (note different scales), in k to o as individuals per 10 m^3, and in p and q as mg (wet) per m^3. a, polychaete larvae; b, *Calanus glacialis*; c, *Metridia*; d, cirripede nauplii; e, *Oikopleura*; f, copepod nauplii; g, *Pseudocalanus*; h, invertebrate larvae; i, *Calanus hyperboreus*; j, euphausiid larvae; k, *Mysis oculata*; l, *M. mixta*; m, *Aglantha*; n, *Parathemisto libellula*; o, *Sagitta* and *Eukrohnia*; p, weights from the 0.073-mm net; q, weights from the 1-mm net.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m
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p
0.073-mm
100 mg/m3
q
1-mm

in stage I with the effect diminishing in older copepodites. The present data give no evidence of diurnal vertical movements in *Calanus hyperboreus*. *Metridia longa* was certainly more abundant near the surface at night than during the day. *Pseudocalanus* sp. also showed evidence of diurnal vertical movement, at least in stages I and II, if not in older copepodites.

Tables 3-5 and 3-6 show the vertical distribution of zooplankton at station 79-F, in July and in September. A few changes occurred between the 2 dates, in daytime. Copepodites and nauplii of copepods were higher in the water in fall than in early summer. For the most part however, distribution seems about the same on both dates.

ICE FAUNA

We were unable to work on the ice at Brevoort Harbour, as planned, so we have drawn upon material from Frobisher Bay ice instead, assuming that the ice faunas in the 2 locations are similar. The ice fauna was found to include 6 copepod species, including the calanoid *Pseudocalanus* stage V male (found as 8 individuals per m^2 of ice surface), the harpacticoid copepods *Harpacticus superflexus* adult (46 per m^2), *Tisbe furcata* adult (62 per m^2) and *Ectinosoma* sp. adult (15 per m^2), the cyclopoid copepods *Cyclopina schneideri* adult (54 per m^2) and *C. gracilis* adult (15 per m^2), unidentified copepodites (177 per m^2), the amphipod *Onisimus glacialis* 3 to 5 mm long (54 per m^2) and eggs 0.27 to 0.32 mm in diameter (77 per m^2). This material was collected on May 4, over about 40 m of water at the head of Frobisher Bay.

FOOD RELATIONSHIPS

Pelagic fish larvae of 9 genera, the individuals ranging in total length from 11.2 to 37.4 mm, were examined for stomach contents. (See section 6 of this report for comments on the fishes.) Results of this food study are shown in Table III-12. There were 49 fishes examined, with a mean total length of 21.0 mm. At least 20 invertebrate species comprised the food.

The largest larval fishes were *Triglops pingeli* (mean total length 32.0 mm). They had eaten some of the largest food organisms (*Mysis*, *Spiratella*, *Lamprops*), and overall their food species were large to medium (within the size range of all the food species considered). Next in size was *Icelus* (mean length 26.4 mm), in which food components were in the medium size range. *Liparis fabricii* (mean length 22.8 mm) contained food items mainly in the medium size range, but with a few large ones. *Gymnocanthus tricuspis* (mean 19.0 mm) contained medium size items and some small ones (nauplii, eggs). *Myoxocephalus scorpius* (mean 16.4 mm) also contained medium and small food items. *Leptagonus decagonus* (mean length 17.4 mm) contained only small food, as did *Aspidophoroides olriki* (16.4 mm). *Stichaeus punctatus* (12.9 mm) had only empty stomachs.

Table 3-5. Vertical distribution of zooplankton groups, day and night, at station F-c and F-d, 20-21 July 1979.

	Day			Night	
0.073-mm mesh nets					
numbers per 1 m^3	0-10 m	10-20 m	20-35 m	0 m	5 m
polychaete larvae	34	58	0	2	5
copepod copepodites	55	1407	804	21	149
copepod nauplii	2217	2789	0	665	218
cirripede nauplii	0	0	30	1	2
1-mm mesh nets					
numbers per 10 m^3	5 m	15 m	25 m	0 m	5 m
medusae	+	0.9	0.4	+	0.3
ctenophores	0	+	0	0	0
pteropods	0	+	+	+	0
hyperiids	0.8	0	0.2	0.2	4.0
mysids	0	0.8	1.6	4.3	31
euphausiid adults	0	0	0	+	+
decapods	0	0	+	0.1	6.6
chaetognaths	0.3	2.3	2.0	0.5	1.1

Table 3-6. Vertical distribution of zooplankton groups, day and night, at station F-d, 16-17 Sept. 1979.

0.073-mm mesh nets	Day			Night	
numbers per 1 m^3	0-10 m	10-20 m	20-35 m	0 m	5 m
polychaete larvae	11	1	23	2	7
copepod copepodites	3559	0	37	610	1196
copepod nauplii	6629	0	0	2520	1595
cirripede nauplii	0	0	1	0	+
euphausiid nauplii	11	0	0	+	+
eggs	697	389	0	190	642
1-mm mesh nets					
numbers per 10 m^3	5 m	15 m	25 m	0 m	5 m
medusae	0.2	0.3	2.5	0.3	2.3
ctenophores	0	0	0.3	0	0
mysids	0	0	0.3	2.2	150
euphausiid adults	0	0	0	0	1.2
decapods	0	0	0.3	0	6.1
chaetognaths	0.5	0.6	1.6	21	0.6

The stomach contents of 4 adult *Boreogadus saida* (the polar cod) were examined in Brevoort Harbour. These cod ranged from 89 to 272 mm total length, and all were collected between 6 and 12 August. Stomach contents of the cod included 6 planktonic species: *Mysis oculata*, *Calanus hyperboreus*, *C. glacialis*, *Metridia longa*, *Pseudocalanus* sp. and an unidentified hyperiid amphipod. There were also unidentified eggs in one stomach. One cod, the largest, contained as well as some plankton 7 species of benthic amphipods.

DISCUSSION

A number of the Brevoort-Cornelius Grinnell Bay zooplankton species are not generally found in the shallow waters amongst the Canadian arctic islands. Most of them are characteristic of warmer water. Included is an unidentified tomopterid polychaete, a group characteristically found only as far north as Davis Strait in this part of the world. This specimen was taken only below 100 m at station 79-D (see Table 1-1). The same station and depth yielded the ostracod *Conchoecia elegans*, an Atlantic species found as far north as Davis Strait, and the copepod *Heterorhabdus norvegicus*. This species was collected also below 100 m at station 79-E, along with the copepod *Chiridius obtusifrons*, which was collected only at that station. Both are basically deep, somewhat warm-water species in Davis Strait and the Labrador Sea, neither evidently occurring amongst the islands of arctic Canada. The chaetognath *Sagitta maxima*, taken only at 130-150 m also at station 79-E, is another relatively deep, north Atlantic species which occurs as far north as the Arctic Ocean primarily in the Atlantic water layer. Finally, the copepod *Calanus finmarchicus*, a North Atlantic species which reaches northward to north Baffin Bay (Jaschnov 1970) was taken only at stations 79-C, D and E at more than 70 m in the Brevoort area. It also occurred in September only at station 79-F between 20 and 35 m in the daytime and at 5 m depth at night.

Something about the nature of the waters in which the zooplankton live may be inferred from the composition of the fauna. The fauna discussed here is almost entirely arctic, with indications of a very small Atlantic component. The arctic nature of the water has already been indicated by the temperature-salinity features described in the first section of this report (see Fig. 1-9). The physical criteria indicated no Atlantic element.

The distribution of *Calanus finmarchicus* in this material is of particular interest because it occurred so rarely, being overwhelmed everywhere by its arctic counterpart, *C. glacialis*. The ratio of these species gives perhaps the best biological indication of the strongly arctic nature of this environment in the summer of 1979.

It is difficult to compare standing stock figures in a meaningful way with most available data from elsewhere. They are however remarkably close to measurements made in upper Frobisher Bay (Grainger 1971), where maximum fine net stocks of 321 and 337 mg (wet) per m^3 were found in 2

successive years. In the same material, coarse hauls were as high as 16 mg (wet) per m^3. Average weight values seem to fall well into the range given by FAO (1972) for parts of Baffin Bay and Davis Strait, showing moderately low standing stocks by world standards, but higher levels than are usually found in most of the Canadian arctic.

Most work on diurnal migrations has been done in warmer seas than the ones studied here. In the arctic, Bogorov's (1946) work was amongst the earliest. He showed that in high latitudes (Barents and White Seas) where permanent daylight persisted in summer, the zooplankton remained at a fairly constant level throughout the 24 hours of a day. In autumn however, when day and night showed an alternating pattern of light, the copepods *Calanus*, *Pseudocalanus*, *Microcalanus* and *Metridia* performed conspicuous vertical migration cycles. The copepods of the genus *Oithona* apparently did not.

Digby (1961) worked in Spitzbergen waters where he showed slight vertical movement in *Calanus* during the summer, the copepods reportedly occurring higher in the water on cloudy days than on bright ones. They were shown however to move through only a very narrow depth range, with their maxima always being found in the upper 10 m. Diurnal movements in *Calanus glacialis* and *C. hyperboreus* were investigated by Kosobokova (1978) in the Arctic Ocean. Adult females of *C. hyperboreus* were described as undergoing no diurnal migrations in summer or winter. The same conclusions were drawn about *C. glacialis* stage V. But adult females were shown to go through slight diurnal movements in summer. None was seen in winter.

Calanus sp. has been perhaps the best studied of all animals involved in diurnal vertical migrations, and such movement has been shown elsewhere in stages from C-III up (Marshall and Orr 1955). It is also a species in which longer term, seasonal vertical movements are well established. In the arctic, Digby (1954) showed a seasonal vertical movement in which nauplii tended to remain deep in summer (as at station 79-E in our material), young copepodites rose in summer to reach fairly close to the surface, and adults rose and sank several times during the course of the year.

Metridia longa has been studied extensively elsewhere and shown to be a consistent diurnal vertical migrant (Raymont 1963). Ussing (1938) found *Metridia* deep in East Greenland fjords during summer, an observation which agrees with our findings at station 79-E.

Considerable attention has been put recently on the flora of the sea ice, but comparatively little has been said about the associated ice fauna. It appears to comprise 2 major components. One is of large animals which are found from time to time in contact with the lower surface of the ice. MacGinitie (1955) reported large numbers of the amphipod *Apherusa glacialis* under the ice off north Alaska, and others followed with references to other amphipods (mainly *Onisimus*) under the ice elsewhere. Horner (1972) suggested that the large amphipods were apparently feeding on the lower surface of the ice. Horner and Alexander (1972) found *within* the ice ciliates and heliozoans. They found nematodes, polychaete larvae,

turbellarians and an unidentified copepod, and they claimed some of these animals were feeding on the ice flora.

Most of the sea ice species reported here are new records for the ice fauna. All are small individuals, evidently able to enter the brine channels in the ice and survive there for a time. We have not yet been able to examine the food of these species. It is tempting to suppose at this time that they feed on the ice flora. Most of them are known herbivores in the plankton. It may be of some importance to notice that none of these species is in fact apparently strongly adapted to ice living (all are well known plankters both in the presence and in the absence of ice). There is the probability therefore that the ice may play a totally non-essential role in the lives of these animals.

Obviously however these animals do pass at least part of their time in the sea ice when it is available. If they feed in the ice, and it is probably true that they do, then the ice supports a temporary food source. If they in turn are fed upon by the amphipods associated with the surface of the ice, and this too seems a probable occurrence, they do indeed make up a link in a food chain involving the sea ice.

It is apparent that the sea ice is a busy place biologically. Light energy, nutrients, plants, small animals and grazers, a full trophic series, all seem to be involved in the cycle of events undergone within it and on its surface. We have a deplorable lack of knowledge of this feature of the arctic marine ecosystem, and we must soon learn a great deal more about it.

The zooplankton forms the principal link between the primary producer plants and the vertebrate resource species, the fishes and the mammals. Zooplankton is the major food of the fishes and mammals, and it is therefore one of the primary environmental features on which the resource species depend. The zooplankton comprises herbivores, mixed feeders and carnivores, each group of which plays a particular role in the food web. We have drawn upon the literature on zooplankton feeding to construct a very approximate food web around the main species of zooplankton found at station 79-A, Brevoort Harbour.

Fig. 3-2 shows the main lines of food transfer among the 3 zooplankton groups involved in the transport of energy from the plants to the vertebrates. The herbivores are of course directly dependent upon the plant producers. The mixed feeders utilize plant and herbivorous animal material. The carnivorous group also appear to be mainly dependent upon the herbivores rather than the often larger members of the mixed group for their food. In a similar way, the vertebrate carnivores seem to depend less upon the invertebrate carnivores than they do on the mixed feeders. The result is to some degree a bifurcation in the feeding scheme, the invertebrate carnivores representing one terminal point in the food scheme, the vertebrate carnivores another.

There was a fairly good relationship between length of fish larvae and size of food species eaten, at least to the extent that only the largest

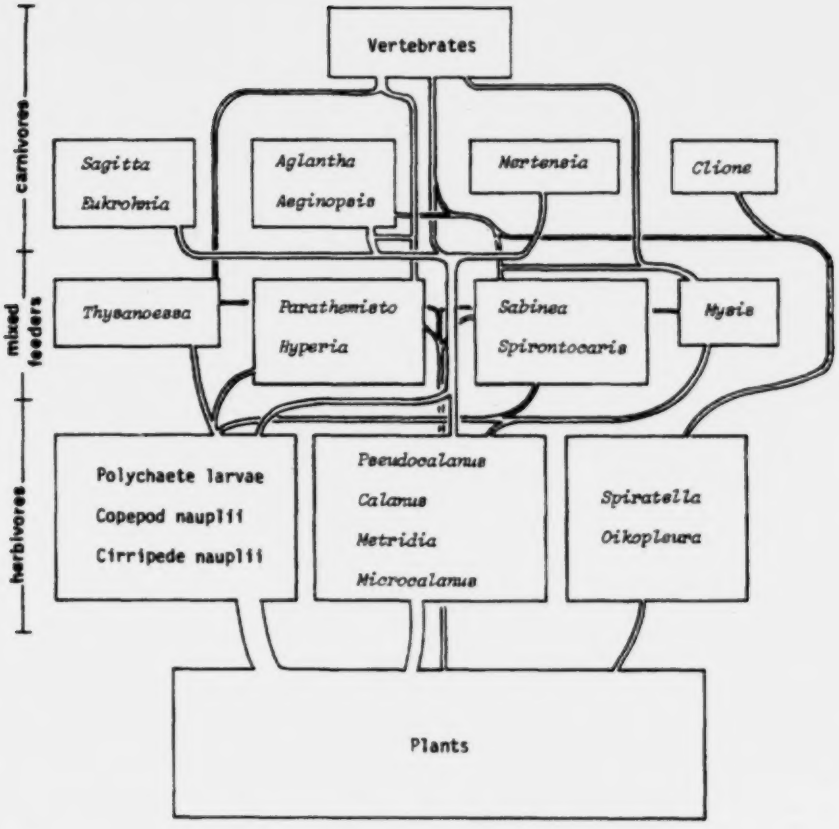

Fig. 3-2. The pelagic marine food web at station A.

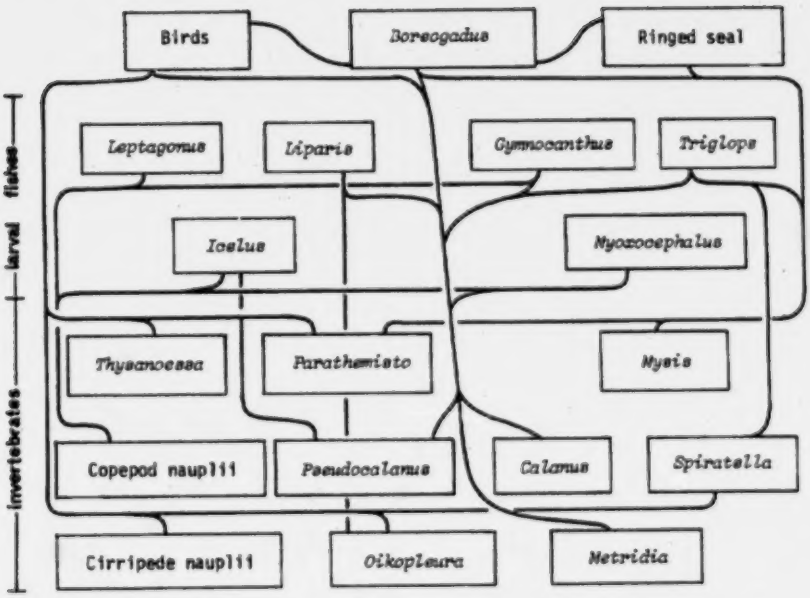

Fig. 3-3. Major pelagic food items of vertebrate predators at station A.

fishes consumed the largest food items, and the smallest fishes ate only the smallest food items. There is otherwise no clear evidence of selection. All the frequently eaten invertebrate species were quite common in the plankton, and all food species except for *Lamprops* (a normally benthic cumacean, found in 1 fish), *Parapleustes* (a quite uncommon amphipod, in 1 fish) and the infrequently reported copepod *Monstrilla* (in 1 fish) were taken in the Brevoort plankton.

The food of the polar cod covers a wide selection of animals. Pelagic forms have included *Apherusa glacialis*, *Onisimus glacialis* (Barnard 1959), *Mysis oculata*, *Onisimus litoralis*, *Parathemisto libellula*, *Thysanoessa raschii* (Vladykov 1933), *Oithona similis* (eggs, nauplii and copepodites), *Calanus* (nauplii and copepodites), *Metridia longa*, *Euchaeta*, *Acartia longiremis*, *Limacina*, *Conchoecia* and *Oikopleura* (Ponomarenko 1967), in addition to our findings mentioned above.

A comparison of the principal fish food species and the most active diurnal migrants amongst the zooplankton shows an interesting relationship. *Pseudocalanus*, *Metridia* and copepod nauplii were the most commonly found contents of larval fish stomachs, with *Mysis* and *Calanus glacialis* added from adult *Boreogadus*. The same animals were the most active diurnal vertical migrants, with only polychaete larvae, apparently active migrants, not appearing in fish stomachs, and *Calanus hyperboreus*, not recognized as a migrant, but appearing as an important fish food species. The diurnal migrants congregate near the surface at night. The presence of the same organisms as the dominant food of fishes, along with the observed presence of fishes in the same waters at night, indicates active feeding by fishes in dark, near-surface waters.

Fig. 3-3 shows a representation of the food relationships demonstrated here between invertebrates and fishes, as well as some information from the literature on the feeding of ringed seal (Dunbar 1941, McLaren 1958) and birds reported from the vicinity of Brevoort Island (from Smith and Hammill, in press). The ringed seal is a fully opportunistic feeder. The birds considered (*Gavia*, *Fulmarus*, *Clangula*, *Mergus*, *Larus*, *Rossa*, *Uria*, *Plautus*, *Cepphus*) show remarkably similar feeding habits, based mainly on *Parathemisto*, *Mysis*, *Spiratella*, *Pseudocalanus* and *Boreogadus*, all commonly occurring species in the area. Notable similarity is apparent amongst the fishes as well, size being perhaps the major factor in controlling the composition of the menu. It is perhaps a feature of arctic predators that their diet is diverse. Adaptation to a wide choice of food may be a useful quality in a region where individual food species may sometimes be scarce.

SUMMARY

There were 74 species of zooplankton found in the Brevoort Island area and in Cornelius Grinnell Bay in 1979. Nearly all were formerly known from Davis Strait. The zooplankton fauna is very predominantly arctic, with indications of only a small influx of Atlantic elements.

Standing stocks from fine nets (the mainly herbivorous fraction of the zooplankton) ranged from 61 to 321 mg (wet) per m^3. From coarse nets (roughly the carnivorous fraction), levels varied from less than 1 to 32 mg (wet) per m^3. Stocks were judged moderately low by world standards, but relatively high for high latitudes.

The major copepod species showed evidence of undergoing the typical arctic development cycle of at least one year duration.

Examination of daylight vertical distribution at several stations gave indication of division of the water column by related species. The amphipod *Parathemisto libellula* occurred mainly nearer the surface than *P. abyssorum*, and the chaetognath *Sagitta elegans* occupied depths generally higher in the water column than its relative *Eukrohnia hamata*.

Daytime vertical biomass distribution at offshore stations was greatest in the deepest water (up to 133 mg (wet) per m^3), both in the fine and coarse net fractions.

Diurnal vertical migration was shown to occur in several species. The most active vertical migrants were *Mysis oculata*, polychaete larvae, copepod and cirripede nauplii and certain copepod copepodite stages of *Metridia longa*, *Calanus glacialis* and *Pseudocalanus* sp. Total biomass shifts occurred between day and night, from the lower depths in 30 m of water to the top 10 m in both the fine and coarse plankton fractions.

The sea ice fauna was found to contain several species which evidently live within the ice. Several had not been recorded from the sea ice before. All members of the ice fauna are planktonic species, and have been found planktonically in the presence and absence of sea ice. Evidently none is strongly adapted to sea ice living. They do seem however, at least during part of the year, to form part of a food chain which originates in the sea ice.

The pelagic food web in Brevoort Harbour shows the usual herbivorous and omnivorous groups, trophically based on the primary plant producers. However, the invertebrate carnivores seem to be dependent much more upon the herbivores than the omnivores, and the vertebrate carnivores more on the omnivores than on the invertebrate carnivores. In this way, there is a tendency towards development of 2 "top" carnivore levels, one consisting of such things as medusae and ctenophores (perhaps little used by larger carnivores), the other of fishes, birds and mammals.

The zooplankton in the Brevoort region provides food for several fishes, birds and mammals. Young fishes, at least, appear to utilize the nighttime, surface-water concentrations of certain diurnal migrants as a major food source. It is perhaps a feature of arctic carnivores that they are frequently opportunistic feeders, adapted to a wide range of food.

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4. The relative energy content of the macrozooplankton

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INTRODUCTION

In Arctic and subarctic seas species of carnivorous macrozooplankton form an important trophic link between herbivorous microzooplankton and various vertebrate carnivores. Although much has been learned about the occurrence, population structure and general ecology of some of the common species (Dunbar, 1940; 1941; 1946; 1957; 1962) little is known concerning the energetics of production.

Recently, a long-term research program was begun in Frobisher Bay to investigate aspects of the bioenergetics of principal macrozooplankton species in the southern Baffin region. It is useful initially to have some quantitative assessment of the relative energetic significance of the major groups prior to selecting species for more detailed examination. Studies thus far indicate that, on the basis of abundance and body size, hyperiid amphipods and chaetognaths are probably the principal carnivorous macrozooplankton in the region. However, ctenophores and coelenterates also appear to be very abundant at times in the coastal waters, but because of difficulties in collecting and preserving them their abundance has never been adequately measured. Thus, the energetic significance of both ctenophores and coelenterates in relation to the hyperiids and chaetognaths is not at all clear. The great variation in size and organic composition of the different species precludes the use of numbers of individuals as a reliable method of comparing energetic importance. Basing comparisons on either wet or dry weight biomass determinations may also prove misleading given the very great differences in water content and inorganic matter content between such groups as amphipods and ctenophores. A more realistic approach is to base the comparison on the relative amount of energy, measured in calories, contained within each of the groups in the community. This is presently being done at intervals at selected stations in Frobisher Bay. However, even this is at best only a first approximation and a preliminary step towards clarifying what is essentially a dynamic phenomenon. Estimating the proportion of available energy that is being utilized on a long-term basis by the dominant groups of organisms is a complex undertaking, requiring comprehensive information not only about fluctuations in biomass, but also about rates of energy consumption and transformation.

The M.V. *Calanus* operations near Brevoort Island provided an opportunity for obtaining additional information about the partitioning of energy within the macrozooplankton community in a nearby coastal area of southern Baffin having somewhat different hydrographic conditions from those in Frobisher Bay. A preliminary comparison of the two areas may prove useful in providing a quantitative indication of macrozooplankton organisms that are of more widespread significance in production processes in southern Baffin coastal waters.

MATERIALS AND METHODS

Macrozooplankton material from the following collections are considered in the present chapter:

Sample no.	Station	Date	Time	Depth of tow (m)
TC1	5	July 29	1640	50
TC3	79A	August 8	1500	30
TC4	79D	August 11	1820	150
TC5	79A	August 13	1413	30
TC9	5	August 17	1655	45

The two samples collected at station 5 (63°40.2'N, 68°26.3'W) in Frobisher Bay shortly before and after the Brevoort Island sampling are included for comparative purposes. The other stations are as described in Section 1 of this report.

Samples were collected by oblique tows with a 1-metre bongo net (1 mm mesh). Tows were standardized as much as possible by using a method similar to that of Sands (1978). With the vessel stationary the net was lowered to within a few metres of the bottom. The vessel then moved forward at approximately 5 km/hr. After two minutes the net was winched in at a rate of 0.5 m per second. Tows were repeated three times at each station. The contents of one of the bongo nets in each tow were preserved, with the samples from each tow kept separate and designated as a, b, or c. The ctenophores, *Mertensia ovum*, disintegrate when preserved in formaldehyde and were thus removed immediately from the samples and fixed in 10% acetic acid prior to being preserved separately in the propylene-glycol formaldehyde preservative described by Adams et al. (1976). The preserved samples were later sorted to species and counted.

The contents of the other bongo net obtained during the three tows were pooled, sorted into the principal taxonomic groups (copepods and other microzooplankton were excluded from this analysis) rinsed in isotonic ammonium formate, placed in freeze dryer flasks and frozen in dry ice. The samples were subsequently freeze dried in Frobisher Bay prior to shipping south.

Dry weights of the samples were measured after drying to constant weight at 60°C. Samples for caloric analysis were finely ground and

formed into approximately 10 mg pellets. Caloric content was determined with a Phillipson microbomb calorimeter (Phillipson, 1964). Benzoic acid (20-40%) was added to tissues containing a high ash content (ctenophores, coelenterates and fish larvae) in order to ensure successful ignition of the sample. Ash content was determined by incineration of tissue samples at 500°C for 4 hours.

Chaetognaths were inadvertently overlooked in sorting samples to be frozen at Brevoort Island, so it was necessary to obtain biomass estimates by measuring the total dry weight of animals from the formalin-preserved samples collected in the same tows. These samples were not used for caloric or ash analysis.

The biomass of each taxonomic group in the freeze-dried sample was determined in terms of dry weight, and the percentage contribution of each component group was calculated. From the dry weights and the weight specific caloric value of each group the caloric biomass was calculated and expressed as a percentage of the summed energy content of all the groups in the sample. In instances where the amount of tissue was inadequate for reliable caloric and ash determination, values obtained for comparable groups at other stations were used for calculating energy content.

RESULTS AND DISCUSSION

The oblique tows were made from different depths at each station in order to sample the entire water column. As the volume of water filtered was not measured, no attempt will be made to compare absolute caloric values at different stations; only the relative distribution of energy (expressed as a percentage of the total macrozooplankton energy) among the various taxonomic groups in each sample is considered.

A summary of the occurrence of the principal taxonomic groups in each collection, expressed as numbers of individuals, percentage of total dry macrozooplankton biomass and percent of total caloric energy is presented in Table 4-1. Supporting data on species composition, actual dry weights, weight specific caloric values, absolute caloric values and ash contents of the samples are presented in Appendix Tables IV-1 to IV-5, inclusive.

At each of the stations a few groups of organisms accounted for most of the energy in the macrozooplankton community. Thus in Frobisher Bay samples TC1 and TC9, 98.7% and 98.5%, respectively, of the total energy was associated with the following four groups of animals (in order of decreasing importance): ctenophores, hyperiid amphipods, chaetognaths and decapod larvae. Similarly, in the Brevoort Island TC3, TC4 and TC5 collections, 93.0%, 95.9% and 97.6%, respectively, of the energy was accounted for by the following six groups of animals (in order of decreasing importance): mysids, coelenterates, hyperiid amphipods, pteropods, chaetognaths and ctenophores. The ctenophore dry weight biomass was only significant in the TC5 sample. This appears to contradict the results

Table 4-1. Total number of individuals, percentage of dry biomass and percentage of caloric energy in the different taxonomic groups collected by oblique tows (3 tows pooled) in Frobisher Bay and at Brevoort Island.

	TC1			TC3			TC4		
Taxonomic group	No.	% dry biomass	% caloric energy	No.	% dry biomass	% caloric energy	No.	% dry biomass	% caloric energy
Amphipoda (Hyperiid)	30	9.7	20.6	15	0.4	0.9	95	9.7	21.3
Amphipoda (Gammarid)	0	0.0	0.0	0	0.0	0.0	3	0.0	0.0
Chaetognatha	15	2.2	4.9	54	2.7	6.9	142	10.0	24.7
Euphausiacea	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0
Coelenterata	9	0.3	0.2	30	51.8	11.4	145	68.2	33.6
Ctenophora	19	82.3	63.1	0	0.5	0.3	25	0.0	0.0
Pteropoda	0	0.5	0.9	3	0.0	0.0	8	10.1	16.3
Decapoda (Larvae)	100	4.8	10.1	47	0.8	2.0	15	1.7	4.0
Polychaeta	1	0.0	0.0	0	0.0	0.0	0	0.0	0.0
Mysidacea	0	0.0	0.0	47	36.4	73.8	0	0.0	0.0
Fish (Larvae)	1	0.3	0.2	9	7.4	4.6	7	0.3	0.2

Table 4-1. Continued.

Taxonomic group	TC5 No.	TC5 % dry biomass	TC5 % caloric energy	TC9 No.	TC9 % dry biomass	TC9 % caloric energy
Amphipoda (Hyperiid)	58	12.9	28.9	11	1.9	5.3
Amphipoda (Gammarid)	1	0.0	0.0	1	0.0	0.0
Chaetognatha	23	1.5	4.1	56	3.6	10.8
Euphausiacea	0	0.0	0.0	0	0.1	0.3
Coelenterata	117	48.3	28.4	15	0.8	0.9
Ctenophora	6	23.4	15.9	62	92.4	79.5
Pteropoda	75	12.7	20.3	1	0.1	0.3
Decapoda (Larvae)	3	0.8	2.1	34	1.0	2.9
Polychaeta	0	0.0	0.0	1	0.02	0.1
Mysidacea	0	0.0	0.0	0	0.0	0.0
Fish (Larvae)	3	0.4	0.3	3	0.04	0.03

obtained from the preserved samples which indicated a significant number of ctenophores in the TC4 sample, but few in the TC5 sample. A possible explanation for this apparent anomaly is that the TC5 freeze-dried ctenophore sample was incorrectly labelled and belongs in fact in the TC4 series. However, there is no firm evidence to confirm this. Even if such were the case, it would not alter the basic pattern of energy distribution among the other groups at either station.

The inclusion of mysids in the above ranking clearly illustrates one of the difficulties in quantifying zooplankton abundance--the existence of non-random aggregations of many species. The mysids completely dominated the TC3 samples from station A, accounting for 74% of the total macrozooplankton energy. However, they were absent in samples from nearby station D. They were also absent in samples collected at station A several days later (TC5). This does not necessarily imply that they had moved out of the area, in fact, other collections made at station A confirm their presence. Marine mysids are reported to commonly occur in large mobile swarms that undertake rapid, extensive vertical and horizontal migrations (MacGinitie, 1955; Bainbridge, 1961; Barnes, 1963). Mysids have also been reported to congregate at times very close to, and often on, the bottom (Robertson et al., 1968), in which case they could remain undetected by standard plankton tows. Assessing the relative energetic significance in the plankton community of such a highly mobile group of organisms would require a more sophisticated and intensive sampling program than that carried out in this preliminary study.

Aside from the mysids, whose precise importance in the plankton is uncertain, it appears that a significant proportion of energy of the Brevoort Island macrozooplankton community was associated with coelenterates, primarily *Aglantha digitale*, while ctenophores were of relatively minor importance, comprising only 0.0 to 15.9% of the energy. This is a marked contrast to the Frobisher Bay samples, which were consistently and heavily dominated by ctenophores (63.1 and 79.5% of the total energy), while the contribution from coelenterates was negligible (0.2-0.9% of total energy).

There was a marked increase in both numbers (19 to 62) and total energy content (1645 cal to 6707 cal) between the first TC1 and the second (TC9) Frobisher Bay samples. Others have remarked on the "characteristically rapid population increase of ctenophores" (Reeve and Walter, 1978), but in most instances, as at present, it has proved difficult to differentiate clearly between mass migration of established populations and rapid production of new biomass. It is possible that given the right conditions similar ctenophore blooms could develop rapidly in the Brevoort area.

In each of the samples, a single species appeared to comprise the bulk of each of the major taxonomic groups (Table VI-1). Thus, in Frobisher, each of the four principal groups, the ctenophores, the hyperiid amphipods, chaetognaths and decapod larvae were exclusively represented by *Mertensia ovum*, *Parathemisto libellula*, *Sagitta elegans*

and *Spirontocaris* sp. larvae, respectively. In the Brevoort Island samples, the five principal taxonomic groups were overwhelmingly dominated by *Mysis oculata*, *Aglantha digitale*, *Parathemisto* sp. (*P. libellula* at the shallow station and *P. abyssorum* at the deeper station), *Spiratella helicina* and *Eukrohnia hamata* (particularly at the deeper stations).

Several groups, including gammarid amphipods, polychaetes, euphausiids and larval fish contributed little to the macrozooplankton energy content at any of the stations.

Differences in the weight specific caloric content of particular taxonomic groups in different samples (Table IV-3) are in most instances probably attributable to differences in species composition. This is certainly true in the case of the pteropod samples which consisted of varying numbers of the two species *Spiratella helicina* and *Clione limacina*. Our other studies indicate that the two have very different caloric and ash contents. Among ctenophores and coelenterates, much of the variation in caloric value appears to result from the difficulty in removing extraneous seawater. The very low caloric content reported for ctenophores and coelenterates is characteristic of these gelatinous organisms and is attributable to the very high inorganic ash content (Table IV-5). The bulk of this ash is derived from the salt in the large volume of seawater that permeates the body structure. The gelatinous consistency makes it difficult to remove excess seawater in a standardized manner without a significant loss of tissue. This probably explains some of the exceptionally low caloric values obtained for some of the Brevoort coelenterate samples that were sorted and rinsed in the field, often under less than ideal conditions. Thus, the very low value obtained for the TC3 coelenterate sample (0.43 cal/mg) is attributable to the unusually high ash content of the sample (76.3%). No attempt has been made to express the caloric values in terms of ash free dry weights, because the main interest lies in the total calories attributable to each taxonomic group, and this is most readily calculated on a dry weight basis. Extraneous ash would alter both the dry weight and the weight specific caloric value of the sample in a compensatory manner.

It would be unwise to formulate broad generalizations about macrozooplankton energetics in the Brevoort area on the basis of the preliminary data obtained in the present study. Several important factors must be considered in the interpretation of the data.

First and foremost, we are dealing with a dynamic, continuously changing system. The present observations reflect the situation during a very brief span of time. From the observations we have identified several groups of organisms (as well as species within these groups) that accounted for the bulk of the energy contained in the macrozooplankton community at the particular time and place of sampling. Whether such patterns of energy distribution persist for extended periods or recur from year to year can only be ascertained by a long-term sampling program such as that currently underway in Frobisher Bay. Clearly, some of the groups such as the decapod larvae have only a limited residence time in

the plankton so that their overall contribution to the energetics of the system is probably far less than suggested here.

Three principal factors are responsible for changes in the energy content of the different populations during the year. Both the density and size-frequency distribution of the population may change considerably with time, resulting in fluctuations in biomass. In addition, seasonal changes in biochemical composition, associated with the accumulation and utilization of organic reserves may significantly alter the energy content of a population. Although these factors may result in considerable fluctuations in the relative energy content of the different groups it is likely that certain species will consistently account for a significant proportion of the energy transfer within the community over the long term.

The non-random distribution of zooplankton is a well documented phenomenon. The occurrence of swarms or patches of organisms (exemplified in the present study by the mysids) can result in wide fluctuations in apparent energy distribution among different groups at different times and in different places. For this reason, not too much should be read into individual observations; it is the recurrent patterns of energy distribution among the groups that will be of ultimate significance.

Avoidance of the net by certain species may result in a distortion in the measured energy distribution among the various groups. This would tend to increase the proportion of energy attributed to slow moving forms, while decreasing that of more active forms. The precise significance of this factor in the present study is uncertain. Because the degree of avoidance decreases with increasing net size (Fleminger and Clutter, 1965) the largest practicable net was used. It is unlikely that net avoidance substantially influenced the overall pattern of energy distribution observed.

In this preliminary study we have quantitatively shown that certain groups of animals, and particular species within each group appear to account for a significant proportion of the standing energy of the coastal macrozooplankton community in southern Baffin waters. Both ctenophores and coelenterates may be of considerable energetic significance in the area. Clearly, the dominant species should be the focus of more intensive field and laboratory studies on the energetics of production of macrozooplankton carnivores in the eastern arctic.

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5. Zoobenthos

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OBJECTIVES

This initial quantitative investigation of short duration was conducted for assessing the marine zoobenthic invertebrates occurring in the harbour and surrounding area of Brevoort Island. The resulting baseline information will provide a point of departure for comparing data obtained from subsequent collections as they opportunely occur.

Assessment involves:

1) Collecting representative samples of zoobenthos at five stations located along a depth transect from the harbour of Brevoort Island to the continental slope.

2) Determining the species composition of the community at each station.

3) Demonstrating the structure of the communities.

4) Estimating the biomass of each community.

5) Determining the dominant species of each community.

6) Demonstrating similarities and differences of the communities.

7) Relating community abundance to some physical environmental factors.

METHODS

ASSOCIATED DATA

Associated data, essentially self-explanatory, are presented in Tables V-2 and V-3. Reported depth of a station is that recorded at the time of sampling. Temperature and salinity values are listed for all grab stations. Temperatures were obtained at stations 79-A and 79-B with a Montedoro-Whitney Corp. model CTU-3B temperature/salinity probe. Temperatures from stations 79-C, 79-D and 79-E were taken with a thermometer

immersed in a water sample taken with a Niskin water bottle within 5 m of the bottom. Salinity values were determined at the Arctic Biological Station from water samples taken within 5 m of the bottom, with a Bissett-Berman model 6230 laboratory salinometer. A salinity value for station 79-B is not reported, as a reading was taken with the above mentioned T/S probe which later proved unreliable for salinity measurement, and no concurrent water sample was taken for analysis.

ZOOBENTHOS

Grab

Stations 79-A through 79-E were each sampled by grab between August 8 and August 12. A "Petterson" grab (Foerst, Chicago) was used to collect samples from stations 79-A, 79-B and 79-C. This grab has an area of 0.065 m^2 and a volume of 5 L. Five grabs were taken at each station for a combined surface area of 0.33 m^2. Stations 79-D and 79-E were sampled with a Wildco-Petersen grab which has a volume of 9.7 L and samples an area of 0.09 m^2. Three grabs were taken at each station for a combined surface area of 0.27 m^2. Due to the hard and irregular nature of the substrate, the depth of penetration, and subsequently the volume of each grab was somewhat variable. A sample was retained only when the jaws of the grab were closed and the volume was greater than 1 litre.

Following collection, each set of grabs was washed on a stainless steel screen with a mesh size of 0.5 mm. All material retained was preserved in formalin (1 part formaldehyde with 9 parts water) for transportation to the Arctic Biological Station where processing took place. Processing consisted of sorting, identifying, counting and weighing the specimens in each sample.

Samples were sorted by hand using a Wild M5 dissecting microscope. In most cases, identification was made to species and the counts of each recorded. Limited time did not permit identification of the amphipods which, along with nematodes, nemerteans, solenogasters, sponges and most bryozoans, were listed by taxon on a collective basis. Similarly, sponges, bryozoans, hydroids and other colonial forms were regarded as one individual or their presence was indicated by an "X." While some names are not necessarily the most recent, those which were used when the animal was initially identified have been retained to permit consistent referral to the species presence at different localities in the Canadian Arctic.

Following sorting and identification, specimens were oven dried at 100°C overnight, then weighed on a Sartorius gravimetric balance in grams to four decimal places. The dry weights exclude tubes of polychaetes and shells of molluscs, but due to the difficulty of separating organic and inorganic fractions, the skeletal spicules of sponges and the calcareous parts of echinoderms are included in the dry weights of these organisms. No effort was made to eliminate gut contents.

Data are presented on a m^2 basis. These values have been derived by multiplying the number and weight of individuals of each species by a factor

proportional to the area sampled for that station. For example, a station consisting of five "Petterson" grabs with a sampled area of 0.33m^2 was multiplied by a factor of 3 to obtain the m^2 values. Most species collected by grab were considered to be representative and the sample values were uniformly converted to m^2 equivalents. The values for certain large epifaunal species, as indicated, have been estimated from dredge samples.

Species data for stations and samples are presented in Tables V-5 and V-6. Density and biomass values for each station are summarized in Table 5-1.

Benthic algae and organic debris from stations sampled by grab were retained, dried and weighed. These values are listed by collection in Table 5-3.

Dredge

The dredge consisted of an iron frame 91.5 cm wide with an attached net 2 m in length with a cod end mesh size of 0.5 cm. The dredge was employed as follows. With the vessel slowly advancing, the dredge was lowered to the bottom and the time it began to sample was noted. A predetermined amount of cable was fed out against the ship's speed, and then the dredge was winched in. The time the dredge left the bottom was estimated from wire angle and tension, and the time noted. Total distance covered was then calculated, knowing the speed of the ship and the rate of release and recovery of cable. Dredge speed along the bottom by this technique varied between 0.5 and 1.5 m/sec. Following collection, the hauls were washed on a 0.5 cm stainless steel screen and preserved in formalin for transportation to the Arctic Biological Station, where processing similar to that for grab samples took place. Associated data and biomass values of the dredges are presented in Tables V-3 and 5-2. Dry weight values of the species sampled by dredge are listed in Table V-7. Weights are shown only for those species whose distribution is more adequately revealed by the dredge than the grab. Due to depth or the nature of the bottom, dredge samples were unobtainable from stations 79-B, 79-D and 79-E.

Substrate Analysis

Substrate samples were obtained by grab for each station at the time that the original samples were taken. These were frozen within 24 hours, except for the sample from station 79-A which was frozen 48 hours after being taken, and transported to the Macdonald College Soil Testing Laboratory where mechanical and chemical analyses were carried out under the supervision of A. F. MacKenzie. Synoptic procedures for these analyses have been presented elsewhere (Wacasey et al. 1979) and will not be repeated here. In most cases the values of the determined substances are presented as levels of the forms that are available to zoobenthos and phytobenthos; however, the significance and relationship of the substances to the biota

remain to be evaluated. Data from sediment analyses are presented in Tables V-8 and V-9.

RESULTS AND DISCUSSION

PHYSICAL FACTORS

Five stations were sampled from 8 to 12 August 1979. The stations, beginning with 79-B in 12 m of water, were selected along a depth transect at points where water depth was 31 m for 79-A, 73 m for 79-C, 152 m for 79-D, and 245 m for 79-E. The distance from 79-B to 79-A was 2.2 km, 2.8 km from 79-A to 79-C, 5.0 km from 79-C to 79-D, and 4.4 km from 79-D to 79-E (Fig. 1-1).

Temperature and salinity of water near the bottom was 0.15°C and about 33°/₀₀ at 79-B, -0.5°C and 33.05 °/₀₀ at 79-A, -0.8°C and 33.16 °/₀₀ at 79-C, -1.2°C and 33.38 °/₀₀ at 79-D and 79-E (Table V-2). The sand fraction of the substrate varied from 64% at 79-C to 95% at 79-B (Table V-8).

SPECIES COMPOSITION

The sizes of the species ranged from 0.5 to 200 mm, the lower limit determined from the mesh size of the washing screen. Identified species from all collections numbered 286 (Table V-4); however, if the unidentified amphipods, nematodes, nemerteans, bryozoans, and calcareous sponges are included, the total might be estimated at 350 species. This is fewer than the 500 species that were collected from a similar sized area in upper Frobisher Bay (Wacasey et al. 1979), but the latter area was sampled more frequently over several years. Experience has shown that the number of species in a community is from two to three times more than the number obtained from a sampled area of 0.33 m^2, indicating the presence of a large number of "rare" species. The number of reported species for a community can vary with the sample size, sample site, sample time, mesh size of the washing screen, and the number identified.

Table V-5 gives lists of reported species with their densities for each station sampled by grab. Table 5-1 lists the total number of species and densities by station. Station 79-B has the fewest number of species with 38, but the greatest number of individuals. Species-numbers relationships, although they have been used to describe and differentiate communities, are of limited meaning, because they provide little information on the mass of the standing stock.

Most of the reported species are common to the communities in the study area of Brevoort Island, and these species have been collected in upper Frobisher Bay (Wacasey et al. 1979). Less than 5% of the species are new to our arctic investigations or have been infrequently collected. These species, which are generally regarded as part of the North Atlantic fauna

are *Brania clavata*, *Exogone hebes*, *Exogone verugera*, (polychaetes); *Cylichna occulta*, *Crenella decussata*, *Cuspidaria obesa*, *Thracia septentrionalis*, *Yoldiella fraterna* and *Yoldiella frigida* (molluscs).

BIOMASS

All stations differ in the amount of biomass that is present. Table V-6 lists the species representation of biomass for each station and total biomass for each station is given in Table 5-1. Station 79-B, with 38 species, has the lowest biomass of 5.96 g. Station 79-C, with 159 species, has the highest biomass of 41.52 g. The above values have been calculated from the grab samples.

Estimates of biomass of the larger, less dense species collected by dredge at 79-A and 79-C do not exceed 0.5 g/m^2 (Table 5-2). Since the collecting efficiency of the dredge was thought to be low, the dredge values may be underestimated. If the values are increased 3 or 4 times, the additional amount to the grab biomass value does not appreciably change the total biomass for each of the stations. Similar findings at stations in upper Frobisher Bay (Wacasey et al. 1979), where the epibenthic biomass averaged 2.82 g/m^2 at 60 m depths, indicate good estimates of community biomass can be achieved with adequate grab samples, providing sampling is on soft bottoms. Dredges or trawls will provide information on the large species that may be missed by grabs. At stations 79-A and 79-C much of the epibenthic biomass is present in the echinoderms such as, *Strongylocentrotus droebachiensis* and *Heliometra glacialis*.

In the Brevoort Island area biomass appears to be greatest in depths of 30 to 80 m (Fig. 5-1). Since samples were not taken in depths of 35 to 70 m, estimates for these depths are not available, and this oversight prevents the depth delineation of communities that appear to have the greatest biomass. Data from Frobisher Bay (Wacasey et al. 1979) indicate the greatest biomass is distributed on soft bottoms in depths of 30 to 50 m (Fig. 5-2).

The biomass estimates as presented for the Brevoort Island stations were obtained from a single sampling period. Multiple sampling over several years would provide a much better average of the biomass for a community. The relative differences between the values of biomass as related to depth are believed to reflect the functional levels of the communities at these depths. Communities at depths greater than 15 m are subjected to less fluctuations of physical factors and communities at depths of 35 to 50 m are within the photic zone where abundant macrophytes provide an areal complexity and added food production. Community biomass is greatest in a diversified habitat maintained by small fluctuations of the physical environmental parameters.

Table 5-1. Density and biomass of benthic invertebrates collected by grab from stations in the Brevoort Island area, 1979.

Station	Water depth (m)	No. of species	Density no./m^2	Biomass g/m^2
79-A	31	102	15798	31.8259
79-B	12	38	17433	5.9565
79-C	73	159	6702	41.5245
79-D	152	117	9280	21.3401
79-E	245	96	6992	17.0057

Table 5-2. Biomass of zoobenthos collected by dredge from stations in the Brevoort Island area, 1979.

Station	Water depth (m)	Sampled area (m^2)	Dry wt. (g)	Total biomass (g/m^2)	Invertebrate biomass (g/m^2)	Fish biomass (g/m^2)
79-A	31	654	324.05	0.4955	0.4211	0.0744
79-C	73	1158	500.23	0.4320	0.4110	0.0210

Table 5-3. Biomass of algae and organic debris (of marine origin) collected from stations in the Brevoort Island area, 1979.

Station	Water depth (m)	Algae g/m^2	Organic debris g/m^2
79-A	31	0.0048	4.8936
79-B	12	8.2956	2.3655
79-C	73	--	--
79-D	152	--	--
79-E	245	--	--

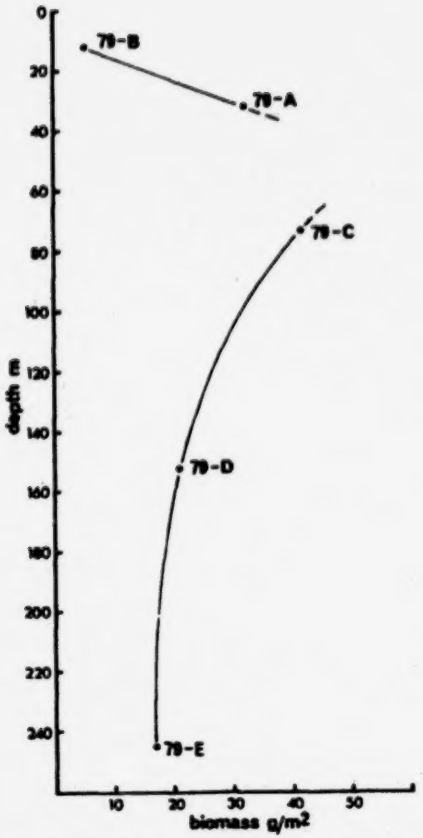

Fig. 5-1. Depth distribution of biomass for stations at Brevoort Island.

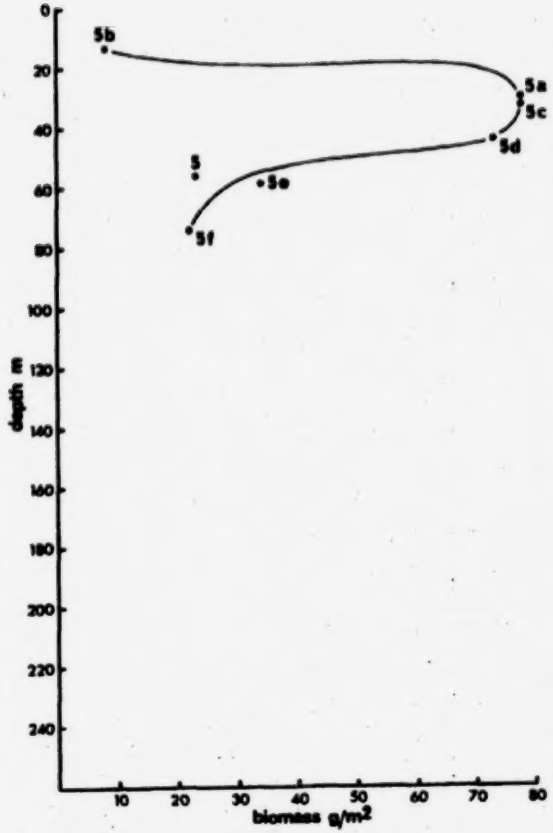

Fig. 5-2. Depth distribution of biomass for stations at upper Frobisher Bay.

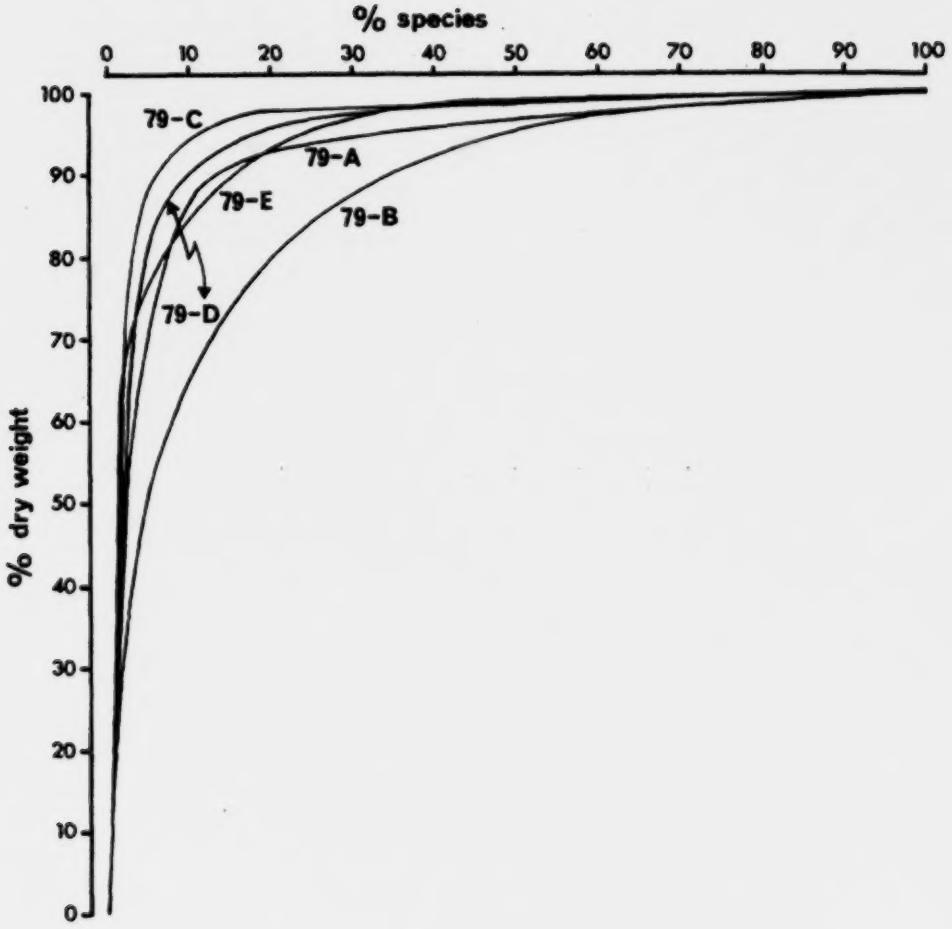

Fig. 5-3. Relation of percent species to percent dry weight for stations sampled by grab at Brevoort Island.

COMMUNITY STRUCTURE

When an adequate number of grabs have been taken to reflect the biomass representation of the identified species from a community, ranking values can be converted to percentages, which are plotted on a cumulative scale against the cumulative percentage of species resulting in cumulative percentage curves for the five stations (Fig. 5-3). The five curves have a similar pattern, but the inflection point of the 79-B curve is lower than the other curves which are similar to curves derived from data obtained from stations in upper Frobisher Bay (Wacasey et al. 1979). These curves appear to fluctuate over a narrow range around a mean which has an inflection point where 10% of the species represent 90% of the community biomass. The proximity of these curves suggests that a common pattern is exhibited by most zoobenthic communities in the Canadian Arctic, and possibly in other communities in other areas of the world.

The departure of the 79-B curve from the norm of the other curves also has its counterparts, although not necessarily to the same degree, in other communities that have been previously sampled (Wacasey et al. 1977). These communities are usually located in shallow water where there are fewer than about 50 species indicating these communities are less stable and are subjected to frequent and extended fluctuations in one or more of the physical environmental factors.

DOMINANT SPECIES

Using the inflection points of the curves in Fig. 5-3, the 10% of the species that account for 90% of the biomass (20% species for 80% biomass at 79-B) were designated as dominants and lists of these dominants are presented by station in Table 5-4. The rank of a given species may vary with time, but the species should remain in the dominant category. Many of the species which are common to station 79-A, 79-C, 79-D and 79-E, are filter feeders and particle feeders. The dominants at station 79-B are mostly polychaetes, which are also filter feeders and particle feeders. The amphipods are listed collectively as a dominant at 79-B. Their representation may be misleading because biomass has not been determined for the individual species and it is doubtful that more than one species would qualify as a dominant. The same situation applies to the amphipods listed in 79-D.

SUMMARY

Zoobenthic collections were made from 8 to 12 August 1979 at five selected stations in depths of water from 12 to 245 m in the harbour and surrounding area of Brevoort Island to provide baseline data on the bottom fauna.

Stations 79-B, 79-A, 79-C, 79-D, and 79-E were located in depths of water of 12, 31, 73, 152 and 245 m respectively. The temperature of the

Table 5-4. Dominant species based on biomass representation for stations in the Brevoort Island area, 1979.

Station 79-A	Station 79-C	Station 79-D	Station 79-E
Astarte montagui	*Thelepus cincinnatus*	*Onuphis conchylega*	*Macoma calcarea*
Diastylis rathkei	*Macoma calcarea*	*Ophiura sarsi*	*Ophiura robusta*
Stegophiura nodosa	*Ophiopholis aculeatus*	*Astarte montagui*	*Astarte montagui*
Macoma calcarea	*Harmothoe oerstedi*	*Macoma calcarea*	*Ophiocten sericeum*
Astarte borealis	*Pista maculata*	*Ophiura robusta*	*Onuphis conchylega*
Phascolion strombi	*Ophiacantha bidentata*	*Nuculana minuta*	*Astarte borealis*
Pectinaria granulata	*Dendrodoa aggregata*	*Ophiocten sericeum*	*Nucula belloti*
Myriotrochus rinki	*Ophiocten sericeum*	Anthozoan	*Nuculana pernula*
Pectinaria hyperborea	*Ophiura robusta*	*Lepeta caeca*	*Pteraster pulvillus*
Colus tortuosus	*Nucula belloti*	*Chaetozone setosa*	*Chaetozone setosa*
Mya truncata	Hydrozoan	Amphipods	*Myriochele oculata*
		Psolus fabricii	*Scoloplos armiger*

Station 79-B
Amphipods
Travisia sp.
Microspio sp.
Peloscolex gabriellae
Scoloplos armiger
Capitella capitata
Spirorbis sp.
Eteone longa

water near the bottom of 79-B was 0.15°C, while the temperatures at the remaining four stations were negative. Salinities at all stations were slightly above 33°/$_{oo}$. The sand fraction of the substrate at the five respective depths was 95, 86, 64, 74 and 65%.

The numbers of species identified from grab collections were 38, 102, 159, 117 and 96. Dredge collections at stations 79-A and 79-C contributed an additional 28 species of invertebrates and 7 species of demersal fish resulting in a total of 286 species that were identified from all stations. At least 350 species occur in the area if unidentified amphipods, nematodes, nemerteans, bryozoans, and sponges are considered. Most of the species are routinely collected in other areas of the eastern Arctic such as Frobisher Bay. Fewer than 5% of the species are new to our investigations or have been infrequently encountered.

The biomass as measured by crude dry weight of all species collected by grab at each station was estimated to be 6, 32, 42, 21 and 17 g/m^2. Biomass of the larger invertebrates and fish collected by dredge from 79-A and 79-C was about 0.5 g/m^2 and does not appreciably change the grab estimates for these two stations.

Cumulative percentage curves relating species to biomass indicate that the zoobenthic communities at all stations, except 79-B, are stable, and that 10% of the species account for 90% of the biomass. Most of these dominant species are common to all four stations and consist primarily of filter feeders and particle feeders. Stations 79-A, 79-C, 79-D and 79-E differ primarily in amount of biomass which appears to be greater in communities at depths ranging from 30 to 80 m of water. Communities at these depths are within the photic zone where macrophytes are abundant, especially in the 30 to 50 m part where they provide an additional food component and areal complexity to the community. The community at 79-B, located in shallow water in a sand substrate, consists of few species and has the lowest biomass. The dominant 20% of the species representing 80% of the biomass are polychaetes and amphipods, which are filter feeders and particle feeders. Few of these, although they may be present, play a dominant role in the other communities. The community at this station does not appear to be stable suggesting that at shallow depths communities are subjected to greater and more frequent fluctuations of physical factors.

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6. Fishes

J. G. Hunter, M. B. Jones and L. M. Rich

INTRODUCTION

The fish resources of Brevoort Island and the adjacent coastal region are of little direct value to man and, until recently, have received little attention. The potential for oil finds in Davis Strait, a subsequent oil mishap and onshore pollution have motivated an examination of possible impacts.

The first study in the immediate area was conducted in 1978 by Aquatic Environments Ltd. and the Arctic Biological Station, for Esso Resources Canada Ltd., Aquitaine Co. of Canada Ltd., and Canada Cities Service Ltd. The report was submitted to the Canadian Government in response to a pre-drilling requirement but remains unpublished. Additional to this study and propelled by the same urgency was a study of larval fishes and other biological components in Davis Strait waters in 1977 by the consulting firm of MacLaren Atlantic Ltd. This material, handled in a similar manner, is available but unpublished. Together, these two studies constitute the principal larval fisheries work outside Greenland and the northern Baffin Island-Lancaster Sound area in Canada's eastern Arctic.

Fisheries resources in the Frobisher Bay region have been under intermittent study and review for about the last 30 years. As resource species, the Arctic char, *Salvelinus alpinus*, (Grainger 1953, Hunter 1976) and the Atlantic cod, *Gadus morhua*, (Patriquin 1967) have been considered. Species distribution records and life history notes have been prepared by Ellis (1962) and for the eastern Arctic by Hildebrand (1948). Specimens from benthic studies have been reported by Wacasey (1979) and for zooplankton studies by Grainger (1971). Frobisher Bay was examined from the M.V. *Calanus* for suitable trawling bottom in the early 1950's, again in 1970 and lastly in 1978 and 1979. Larval fish collected in plankton nets prior to 1967 and collections made with high speed trawls at stations throughout Frobisher Bay in 1970 have not been identified but have been deposited in the National Museums of Canada.

MATERIALS AND METHODS

Samples of larval, juvenile and adult marine fish were collected from Cornelius Grinnell Bay and coastal waters of southern Brevoort Island (Fig. 6-1) with plankton nets, 1-mm mesh tow nets, three small but different otter trawls, gill nets and a dredge. Two vessels were used. In July and September the *Nanook*, an 11-metre longliner stationed at the nearby Allen Island community, was used for the work. It lacked power winches and gear had to be set and pulled by hand. During August the samples were collected using the M.V. *Calanus*, a 15-metre research vessel equipped with winches for handling gear.

The plankton nets consisted of two conical nets with 30-cm diameter mouth openings and 0.233 and 0.073-mm mesh. Two 1-mm mesh nets were used: one of 30-cm and the other of 1-m diameter mouth opening. Tows consisted of three types: vertical, horizontal and oblique. The sampling regime using these nets is shown in Tables 6-1 and 6-2.

Gill nets consisted of 6 panels of 7.6 m of each of 1, 1½, 2, 2½, 3 and 4 inch (254., 38.1, 50.8, 63.5, 76.2, 101.6 mm) stretched mesh. Gill nets were set as floating or sunken nets at the stations and for the times and dates indicated in Table 6-3. Gill nets at stations G and F-b were set perpendicular to the shore. Since fish tend to be caught during a change of light, at dawn or dusk, the unit of effort used is defined as one 6-panel net fishing for a 24-hour period. However, in practice, a net set through any change from night to day or day to night, even if less than 24 hours, was considered a unit of effort.

The otter trawl consisted of a 7.3-m headrope, 12.7-mm mesh net belly and a 25.4-mm cod-end containing a 25.7-mm mesh liner. When towed at 3 knots (154 cm per second) on a single line and 58-m bridle, the trawling doors open to a width of 4.88 m.

The balloon trawl of similar design but with only 2.4-m headrope, and the weasel trawl, with a 1.8-m headrope, 12.7-mm mesh bag and cod-end, did not function efficiently from the longliner. The station location, date and time of the different trawls are shown in Table 6-3.

The dredge consisted of an iron sled frame with a mouth opening of 91.4 X 27.9 cm and a bag 2 m long of 8-mm stretched mesh. Dredge hauls were made from the M.V. *Calanus*. Those containing fish are shown by station, date and duration of haul in Table 6-3.

Samples were preserved in 10% formalin in the field and returned to the laboratory for identification, sorting, measuring and subsampling for food studies. The fine mesh net samples consisting of zooplankton and young fishes of the year were sorted for larval fish specimens. These, in turn, were sorted for one species at a time and the numbers recorded. Since specimens were not plentiful, stations and depths with the greatest number of larval fish were selectively sampled for specimens appearing to contain food in their stomachs.

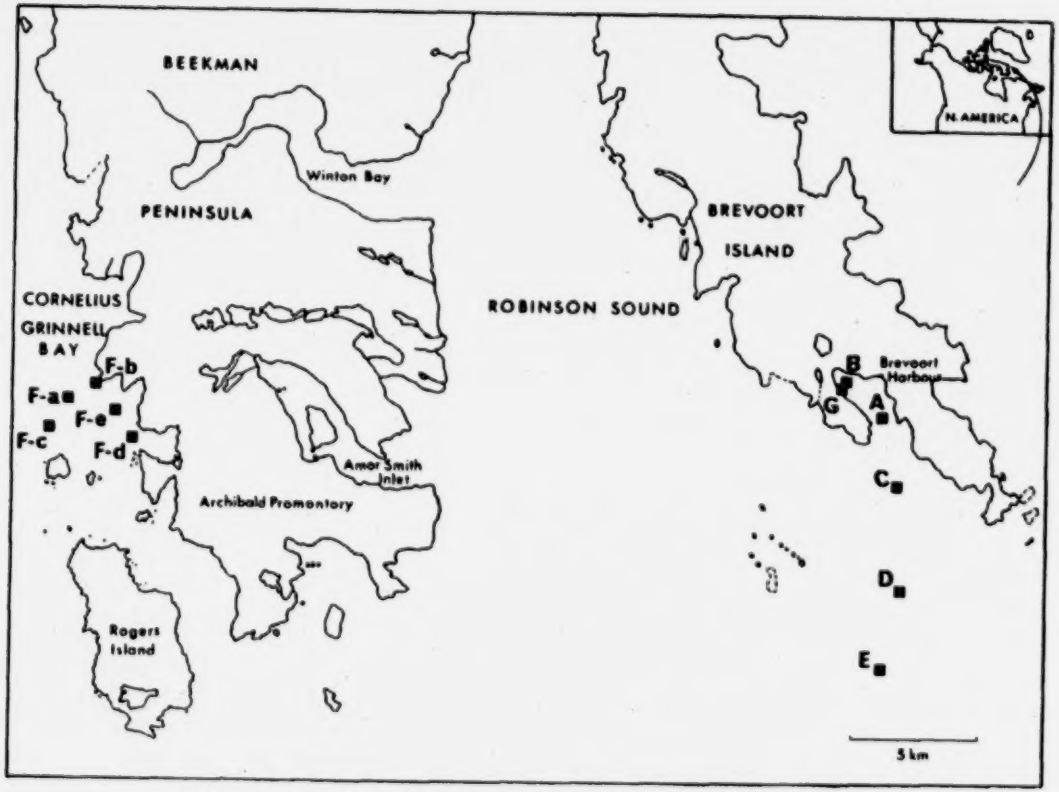

Fig. 6-1. Sampling locations near southern Brevoort Island and in Cornelius Grinnell Bay.

Table 6-1. Plankton sampling at 1979 stations in the coastal waters of southern Brevoort Island.

Net mesh size and diameter	0.233 mm, 30 cm		0.073 mm, 30 cm			1.0 mm, 1 m		
Type of tow	Vertical		Horizontal	Vertical		Horizontal		Oblique
Day (D) or Night (N)	D	N	D	D	N	D	N	D
0			G				a	
				BDAa	a	A a D		
	BDAa	a						B
						DAa	a	
20	DAa	a		DAa	a	E		
						DA	a	
	DAECa	A		DAECa	a	a		AAaaa
40						E		
	DEC			DEC		D		
60								
	C			C				
80						E		
100	DE			DE				
						D		
120								
140	D			D		E		
								ddd
200	E			E				

Depth (m)

A = Stn. A - Aug. 08
a = Stn. A - Aug. 13
B = Stn. B - Aug. 06
C = Stn. C - Aug. 12
D = Stn. D - Aug. 07
d = Stn. D - Aug. 11
E = Stn. E - Aug. 11
G = Stn. G - Aug. 13

Underlined letters indicate Stations at which larval fish were caught.

Table 6-2. Plankton sampling at 1979 stations in Cornelius Grinnell Bay.

Net mesh size and diameter	0.233 mm, 30 cm			0.073 mm, 30 cm				1.0 mm, 1 m			1.0 mm, 30 cm		
Type of tow	Horizontal	Vertical		Horizontal		Vertical		Horizontal		Vertical	Horizontal		Oblique
Day (D) or Night (N)	D	D	N	D	N	D	N	D	N	D	D	N	D
Depth (m) 0	F		f	F	F			F	F		*f*	f	
		F	f		F			F	F		*f*	f	
10		F				F	f						
								F			*f*		
20						F	f						
								F			*f*		
30										F			
		F				F	f						
40													*f*

F = July 20-21
f = Sept. 16
f = Sept. 17

All day tows = Station F-c
All night tows = Station F-d
Underlined letters indicate stations at which larval fish were caught.

Table 6-3. Stations at which adult and juvenile fish were obtained from Cornelius Grinnell Bay and coastal waters of southern Brevoort Island in 1979.

Station	Lift	Gear	Date set	Time set	Date lifted	Time lifted
G	1	Gill net	6 Aug.	1200	10 Aug.	0930
	2	floating	10 Aug.	1000	11 Aug.	0800
	3		11 Aug.	0800	12 Aug.	0830
	4		12 Aug.	0830	13 Aug.	0930
F-a	1	Gill net	20 July	0055	--	0945
	2	sunken	20 July	0945	--	2110
	4		17 Sept.	1020	--	1912
F-b	1	Gill net	20 July	0013	--	0930
	2	floating	20 July	0930	--	2100
	3		16 Sept.	1615	17 Sept.	0945
	4		17 Sept.	0945	--	1845
A	1	Otter trawl	10 Aug.	1600	--	1610
F-d	1	Balloon trawl	20 July	1756	--	1806
	2	Balloon trawl	20 July	1850	--	1900
	4	Weasel trawl	17 Sept.	1612	--	1622
A	4	Dredge	10 Aug.	1400		
	5		10 Aug.	1430		
C	9	Dredge	12 Aug.	1300		
	10		12 Aug.	1330		
	11		12 Aug.	1400		

Larval fish were measured for total length with dial calipers under low magnification and the length recorded to the nearest 0.1 mm. The larval specimens, except for the largest, were placed under a cover slip to straighten them before they were measured.

The width of mouths (the distance between the two corners) of selected larval fish showing a range of lengths were measured with dial calipers to the nearest 0.5 mm.

Adult and juvenile fish caught by the gill nets, trawls and dredges were measured for total length to the nearest millimetre on a measuring board. Ages of specimens were read from otoliths.

RESULTS

The stations at which larval fish were caught at southern Brevoort Island and Cornelius Grinnell Bay are shown by the underlined symbols in Tables 6-1 and 6-2. Catches of larval specimens from the Brevoort Island stations are shown in Table 6-4 and those from Cornelius Grinnell Bay in Table 6-5. Some specimens could not be positively identified; uncertain species are shown with question marks.

The density distributions of the different species caught at the two principal locations are presented in Fig. 6-2 and the distributions of combined samples are shown for night and day collections in Fig. 6-3. The samples composing the distributions are identified by station and time of sampling.

The total length distribution of each larval species is shown by the mean, standard deviation, length range and by the number of the specimens collected in the three sampling periods, in Fig. 6-4.

Length differences of specimens of the same species from different samples taken in the same period were small. Within a sampling period the principal differences in numbers of specimens caught at different depths were between night and day samples. Two of the most abundant species, *Gymnocanthus tricuspis* and *Icelus* sp., were examined for size differences between night and day catches. The length of the two species caught at station A in lifts 55, 56, 64 and 65 on 13 August were:

G. tricuspis
Night samples $\bar{L} = 15.70 \pm 1.95$ (n = 71)
Day samples $\bar{L} = 15.72 \pm 2.09$ (n = 73)

Icelus sp.
Night samples $\bar{L} = 15.89 \pm 2.11$ (n = 18)
Day samples $\bar{L} = 15.56 \pm 2.07$ (n = 38)

Neither species showed a significant difference (P.05) in the variance or mean lengths between the night and day samples.

Table 6-4. Catches of larval fish from coastal waters of southern Brevoort Island in 1979.

Date	6 Aug.	7 Aug.							11 Aug.		8 Aug.				
Station	B	D									A				
Lift	3	6	9	16	17	18	19	20	4-B	4-C	27	28	29	3-A	3-B
Gear	SO	P_6V	$P_{20}V$	SH	SH	SH	SH	SH	SO	SO	SH	SH	SH	SO	SO
Stichaeidae															
Stichaeus punctatus											5				1
Lumpenidae															
Leptoclinus maculatus							1	1				2			
Cottidae											1				
Gymnocanthus tricuspis	2				2	38	39	4	3	2					
G. tricuspis?		1	1												
Icelus?						1			1	1		1	14	1	3
Myoxocephalus scorpius												1			
M. scorpioides?															
Triglops nybelini?															
T. pingeli													11		
T. pingeli?							1								
Triglops sp.															
Agonidae															
Aspidophoroides olriki							4					3	1		1
Leptagonus decagonus				1		1	2					5	4		
Liparididae															
Liparis fabricii													2		
Liparis sp.						1						2			
TOTAL	2	1	1	1	2	41	47	5	4	3	6	14	32	1	5
Depth (m)	10	100	50	5	15	25	40-50	115	150	150	5	15	25	30	30
Volume filtered (m^3)	113	7	3.5	1980	2076	2059	2178	1982	824	824	1021	1062	1609	320	320

Net	diameter	mesh (mm)
S	1 m	1.0
P_6	30 cm	0.233
P_{20}	30 cm	0.073

Type of tow
V - vertical
H - horizontal
O - oblique

Table 6-4. Continued.

Date	13 Aug.									11 Aug.				13 Aug.
Station	A									E				G
Lift	54*	55*	56*	64	65	66	5-A	5-B	5-C	38	39	40	41	57
Gear	SH	SH	SH	SH	SH	SH	SO	SO	SO	SH	SH	SH	SH	$P_{20}H$
Stichaeidae														
Stichaeus punctatus														
Lumpenidae														
Leptoclinus maculatus		2		3										
Cottidae	17			2										
Gymnocanthus tricuspis		59	12	35	39	1	1	1	1	8	69	146	78	
G. tricuspis?														
Icelus?	18	11	28	14	4									
Myoxocephalus scorpius	3	6	1	3										3
M. scorpioides?														2
Triglops nybelini?			3											
T. pingeli	154	7	13	25	3					1		2	1	
T. pingeli?														
Triglops sp.	7			1	1									
Agonidae														
Aspidophoroides olriki		2	1							1		3	2	
Leptagonus decagonus	2	3	3	4	3						1	1		
Liparididae														
Liparis fabricii		2	1	1								3	1	
Liparis sp.		2	1	1						1		1	1	
TOTAL	201	94	63	89	50	1	1	1	1	11	70	156	83	5
Depth (m)	1-3	15	25	25-30	13-16	2-3	30	30	30	130-150	75	40	20	0
Volume filtered (m^3)	994	1096	1140	2144	2059	1960	320	320	320	2959	1965	1728	1592	-

* Samples collected at night between 0103 and 0143 hours.
All other samples were collected during the day--between 0945 and 1900 hours.

Table 6-5. Catches of larval fish from Cornelius Grinnell Bay in 1979.

Date	20 July				21 July		16 Sept.
Station	F-c	F-c	F-c	F-d	F-d	F-d	F-d
Lift	512	515	516	518*	519*	523*	17*
Gear	P_6H	SH	SH	SH	SH	$P_{20}H$	sH
Stichaeidae							
Stichaeus punctatus			1	3	1		
Lumpenidae							
Leptoclinus maculatus					1		1
Cottidae					2		
Gymnocanthus tricuspis				6	3		
Icelus sp.							10
Icelus?				35	150		
Myoxocephalus scorpius	2		1	7	7	1	
Triglops pingeli		1		16	3		
Agonidae				1			
Liparididae							
Liparis fabricii					12		
Liparis sp.				4	2		
TOTAL	2	1	2	72	181	1	11
Depth (m)	0	15	5	0	5	5	5
Volume filtered (m^3)	16	399	399	363	363	16	18

* Sampled collected at night between 2257 and 0056 hours.
All other samples were collected during the day between 1326 and 1634 hours.

Gear notation is as per Table Small "s" denotes 30 cm diameter, 1 mm mesh net.

The age-length relationship of larval *Triglops* sp., *Icelus* sp., *G. tricuspis*, *Myoxocephalus scorpius* and *Leptoclinus maculatus* are shown in Fig. 6-5. Straight line extrapolations of lengths at both earlier and later times than the capture period are projected in the same figure.

Catch, effort and catch per unit of effort of fish caught by different lifts at the three gill netting stations of Brevoort Harbour and Cornelius Grinnell Bay are shown in Table 6-6. Similar catch information from trawl and dredge hauls is presented in Table 6-7.

The length distributions of gill net, trawl and dredge catches are indicated in Fig. 6-6. Mean total length, standard deviation, length range and the number of specimens measured from each type of gear are identified for each species caught.

The age-length relationship and the age composition of combined juvenile and adult specimens from gill nets, trawl and dredge hauls are given for *M. scorpius*, *G. tricuspis*, *I. spatula* and *T. pingeli* in Fig. 6-7.

Contents of the stomachs were removed from selected specimens of larval fish. These have been analysed and are discussed in section 3 of this report. Fig. 6-8 shows the relatively rapid rate of increase in mouth size compared to the increase in total length for eight larval species. The technique of measuring mouth size on formalin-preserved larval fishes is less than ideal and a relatively wide variation in width measurements is evident, particularly for *T. pingeli*. A function of mouth size is evident in the photograph in Fig. 6-9 in which a larval *M. scorpius* is feeding on a smaller larval fish. The sample was taken from a bay off Shark Fiord near Pangnirtung on 10 August 1979.

Analysis of the stomach contents of the larger fish specimens is incomplete. However, in those stomachs containing fish the specimens have been identified and counted. In total the stomachs of 107 *M. scorpius*, 50 *G. tricuspis*, one *I. bicornis*, 24 *I. spatula*, four *T. pingeli*, two *M. scorpioides* and one *Lycodes mucosus* were examined. Ten of the *M. scorpius* were empty and 27 contained fish. One each of *T. pingeli*, *M. scorpioides* and *L. mucosus* contained fish but none had been eaten by *G. tricuspis* or *Icelus* sp. The fish contents of each are itemized in Table 6-8.

DISCUSSION

GEOGRAPHIC DISTRIBUTION

Weather and ice conditions formed major constraints in the sampling program for Brevoort Island and alternate sampling sites were substituted in the fiord waters of Cornelius Grinnell Bay. As a result, the changes that occurred in the larval fish density from a single area, i.e. Brevoort Island, over the course of the summer could not be measured. However, the constraint resulted in additional information on spatial distribution of species between these two close but slightly different habitat areas

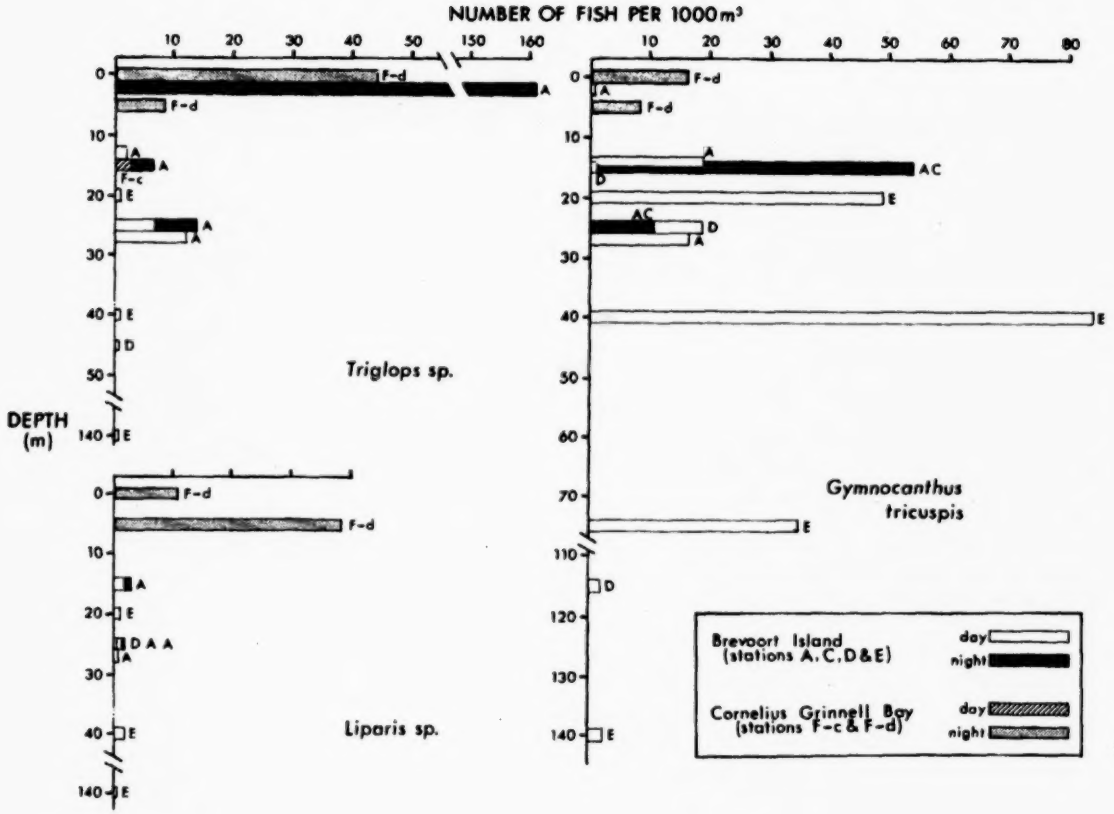

Fig. 6-2. Densities of larval fish species related to depth and station location at night and during the day.

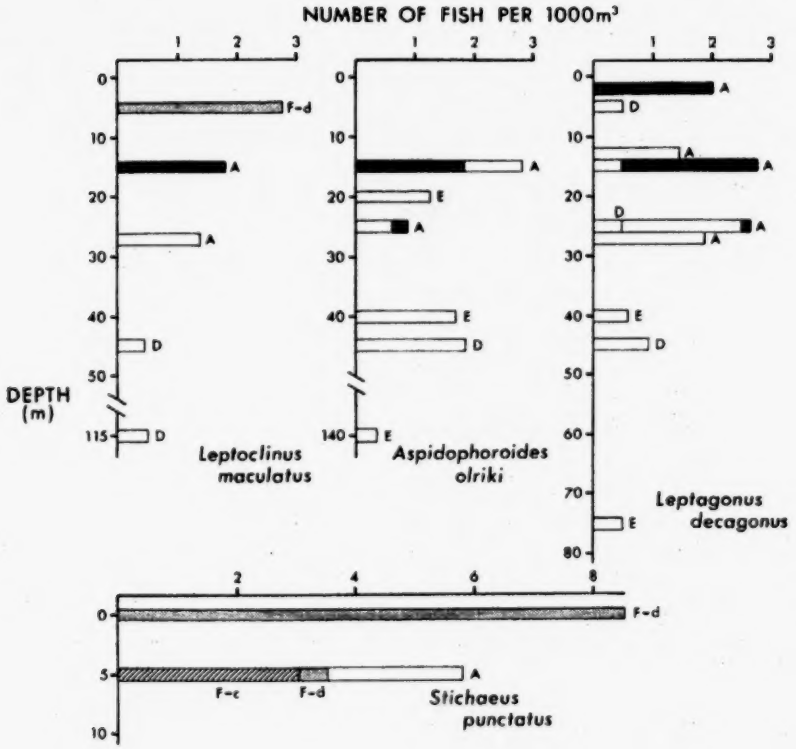

Fig. 6-2. Continued.

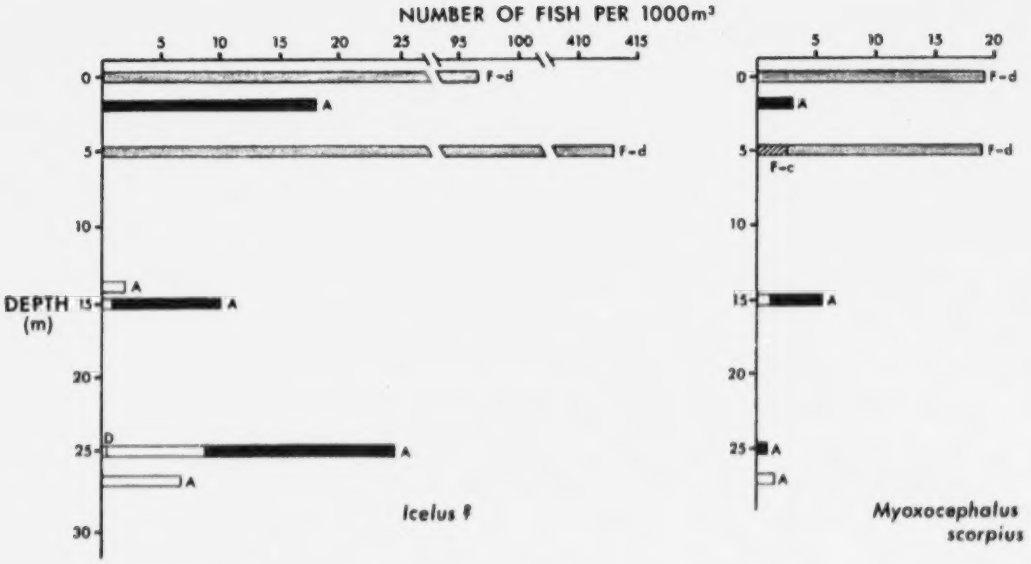

Fig. 6-2. Continued.

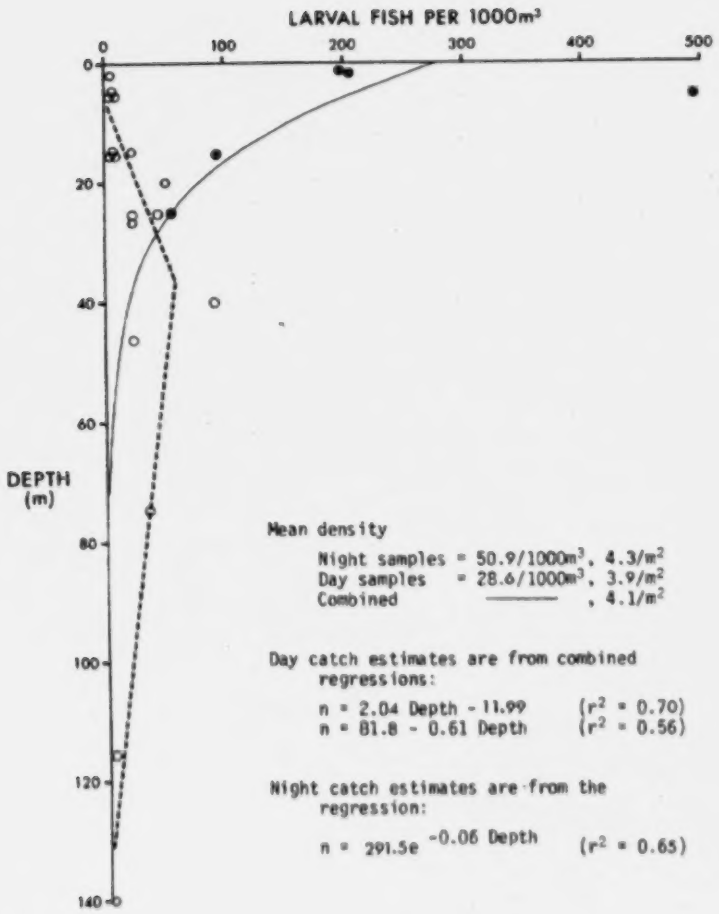

Fig. 6-3. Depth-density distributions of combined samples of larval fishes for day and night periods and the estimated abundance from these samples. Solid circles and line are night samples and estimates, open circles and broken line represent day catches and estimates.

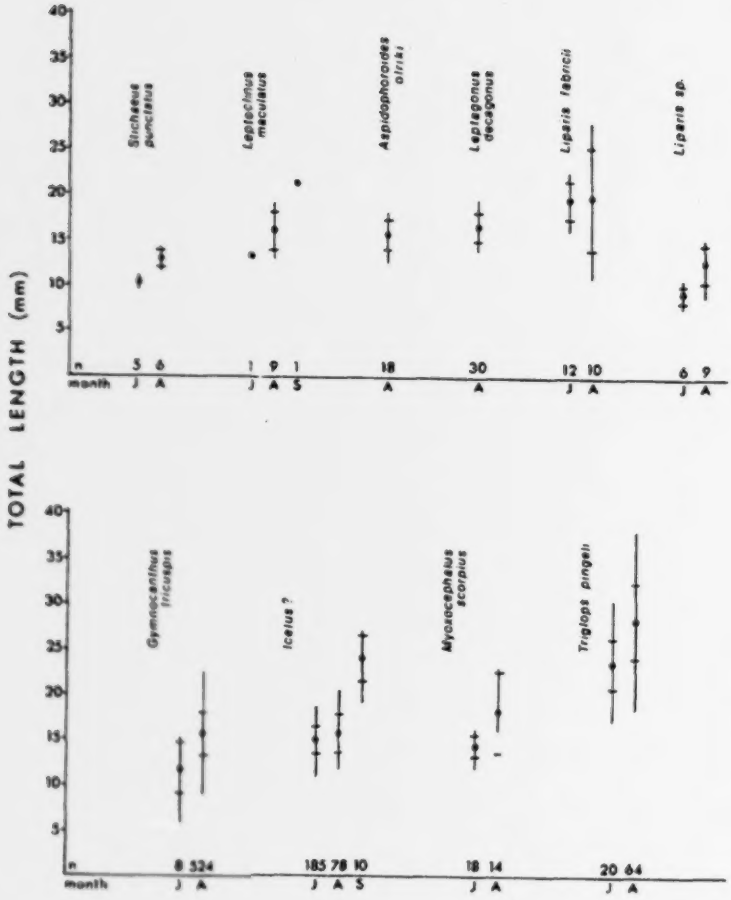

Fig. 6-4. Mean, standard deviation and range of total length of larval fish species caught in Cornelius Grinnell Bay and coastal waters of southern Brevoort Island during July, August and September, 1979.

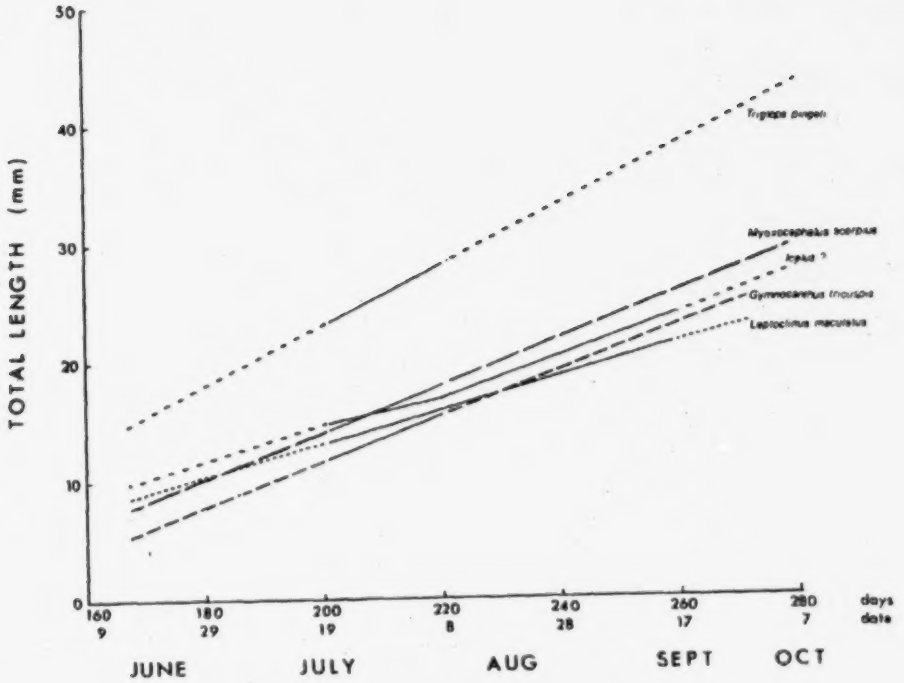

Fig. 6-5. Age-length relationship of larval fish species in the waters of Cornelius Grinnell Bay and southern Brevoort Island. Solid lines join mean length measurements of July 20, August 8 and September 16. Broken lines are straight-line extrapolations of these rates.

Table 6-6. Catches of fish from gill nets set in Cornelius Grinnell Bay and in Brevoort Harbour in 1979.

Date	6 Aug.	10 Aug.	11 Aug.	12 Aug.	20 July		17 Sept.	20 July		16 Sept.	17 Sept.
Station	G				F-a			F-b			
Lift no.	1	2	3	4	1	2	4	1	2	3	4
Gadidae											
Boreogadus saida	1	1		1							
Cottidae	1		2	1							
Myoxocephalus scorpioides	1									1	
M. scorpius	45	12			8	17	1	4	3	6	3
Triglops pingeli						1	2				
Species?											1
Total	48	13	2	2	8	18	3	4	3	7	4
Units of effort	4	1	1	1	0.5	0.5	0.5	0.5	0.5	1	0.5
Catch per unit of effort	12	13	2	2	16	36	6	8	6	7	8

Table 6-7. Catches of benthic fish in trawl and dredge hauls from coastal waters near southern Brevoort Island and from Cornelius Grinnell Bay in 1979.

Figures in parenthesis denote numbers of fish per 100 m^2

Date, Station	10 Aug., A			12 Aug., C			20 July 17 Sept., F-d		
Lift Gear	4 Dredge	5 Dredge	1 Trawl	9 Dredge	10 Dredge	11 Dredge	1 2 Trawls		4 (incomplete)
Gadidae									
Boreogadus saida			1 (0.03)						
Zoarcidae									
Lycodes mucosus			1 (0.03)						
Cottidae									
Gymnocanthus tricuspis	12 (3.67)	9 (2.75)	50 (1.71)	4 (0.98)		1 (0.22)			
Icelus bicornis						4 (0.88)			1
I. spatula	8 (2.45)	7 (2.14)	6 (0.20)	3 (0.73)		2 (0.44)	1	1	3
Myoxocephalus scorpius		1 (0.31)	13 (0.44)						
Triglops murrayi	2 (0.61)								
T. pingeli	1 (0.31)	2 (0.61)	2 (0.07)	3 (0.73)	3 (1.02)	6 (1.32)			
Agonidae									
Aspidophoroides olriki				1 (0.24)		4 (0.88)			
Total	23 (7.03)	19 (5.81)	73 (2.49)	11 (2.69)	3 (1.02)	17 (3.73)	1	1	4
Depth	32	32	25-35	73	73	73	29-40	29-40	29-40
Area Sampled (m^2)	327	327	2928	409	293	456			

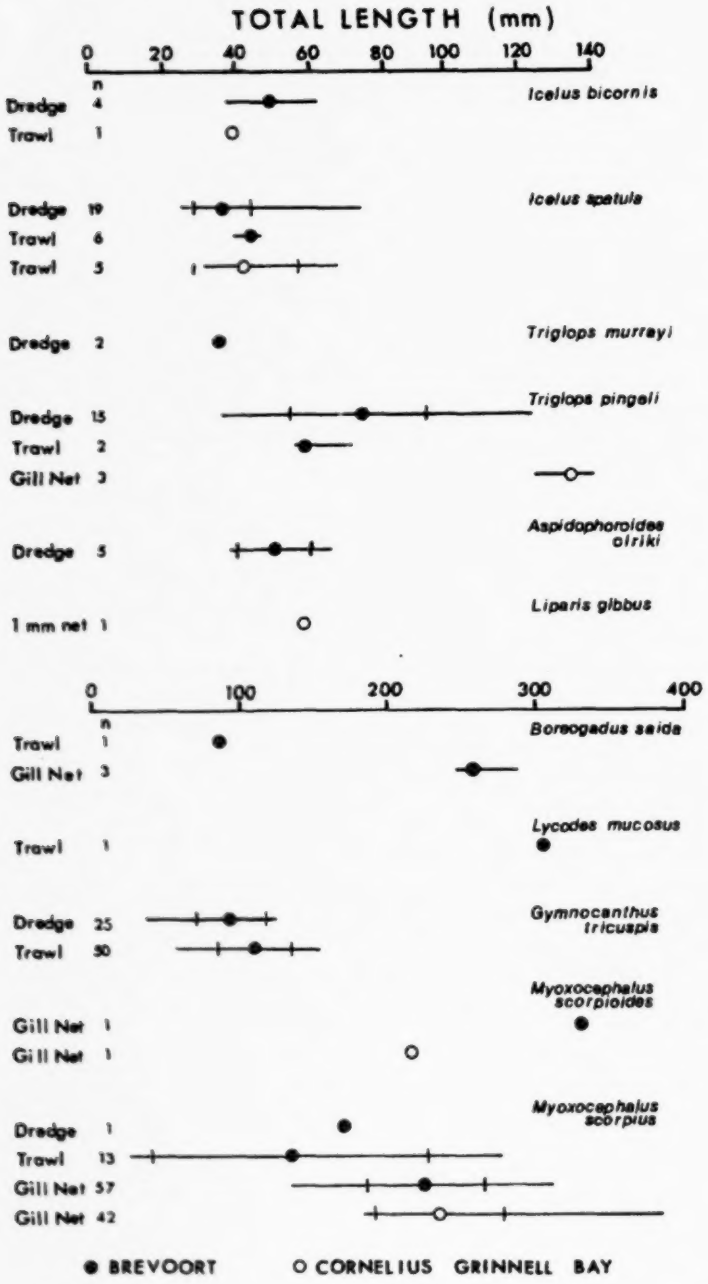

Fig. 6-6. Mean, standard deviation and range of total lengths of species of juvenile and adult fishes caught by gill nets, trawl and dredge hauls in the waters of Cornelius Grinnell Bay and southern Brevoort Island in 1979.

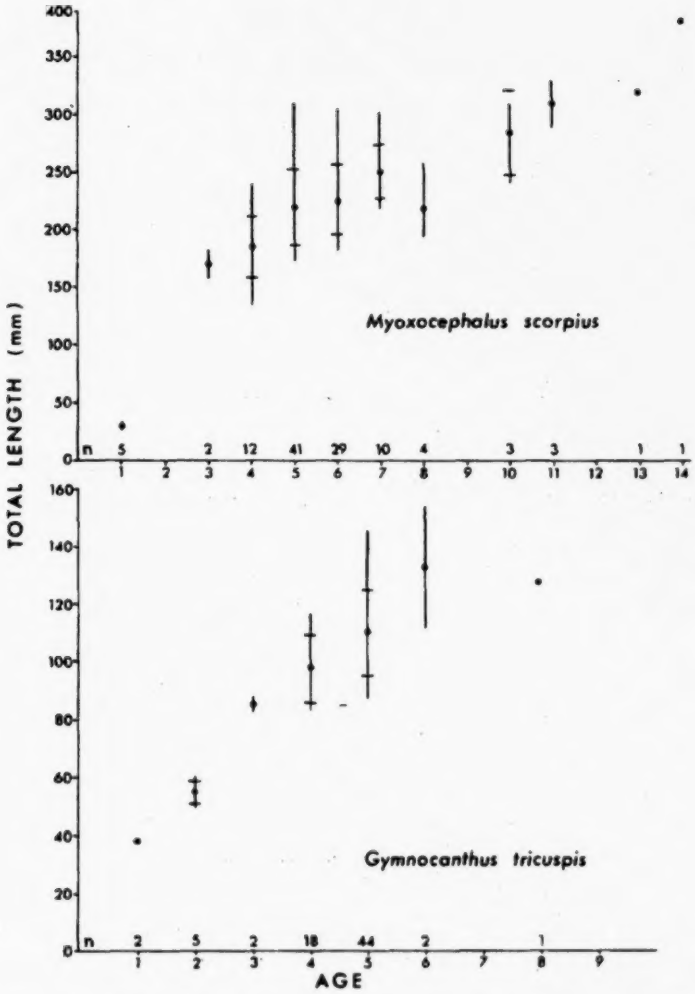
TOTAL LENGTH (mm)
Myoxocephalus scorpius
n 5 2 12 41 29 10 4 3 3 1 1
1 2 3 4 5 6 7 8 9 10 11 12 13 14
Gymnocanthus tricuspis
n 2 5 2 18 44 2 1
1 2 3 4 5 6 7 8 9
AGE

Fig. 6-7. Age-length relationship and age composition of *Myoxocephalus scorpius*, *Gymnocanthus tricuspis*, *Icelus spatula* and *Triglops pingeli* caught in the waters of Cornelius Grinnell Bay and Brevoort Harbour in 1979.

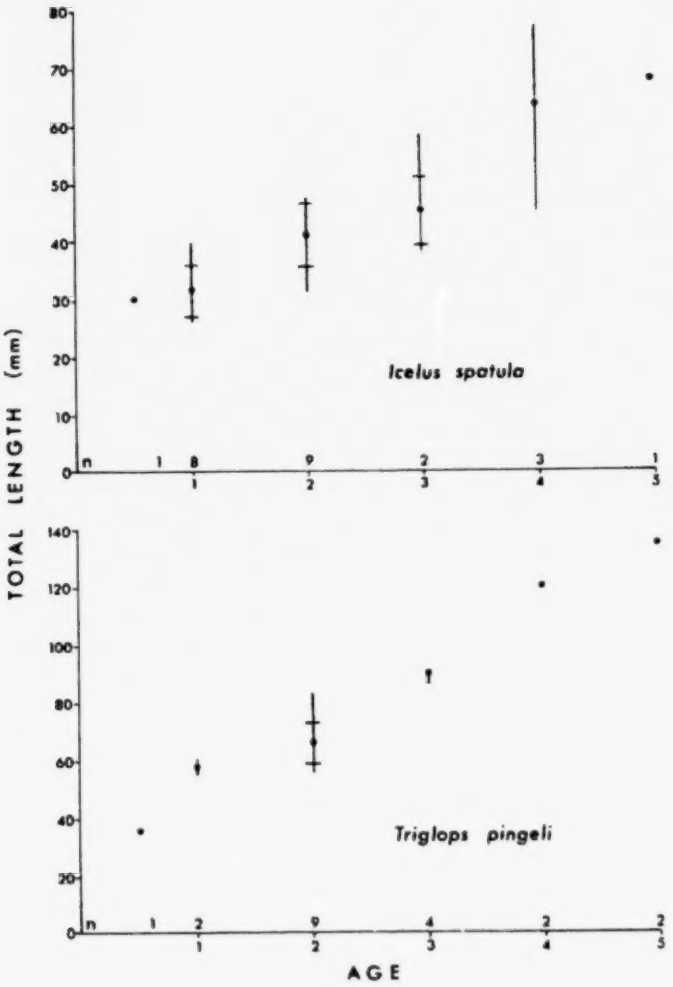

Fig. G-7. Continued.

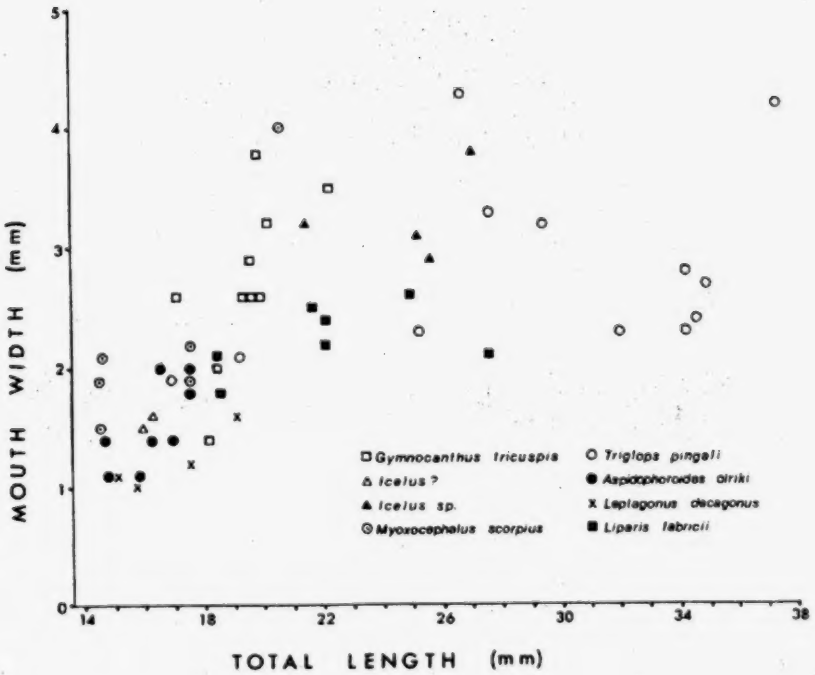

Fig. 6-8. Larval fish length related to mouth width.

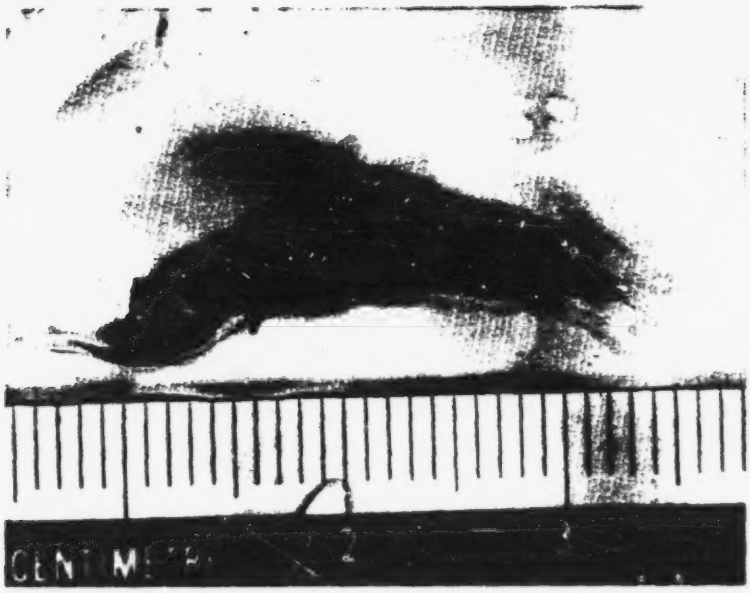

Fig. 6-9. Photograph of one larval fish consuming a smaller specimen.

Table 6-8. Numbers of fish of prey species found in stomachs of predator species.

Predator	Prey	Total number
Myoxocephalus scorpius n = 27	Zoarcidae	
	Lycodes sp.	1
	Cottidae	
	Gymnocanthus tricuspis	1
	Icelus bicornis	3
	I. spatula	4
	Icelus sp.	3
	Myoxocephalus scorpius	6
	Myoxocephalus sp.	11
	Triglops sp.	3
	Liparididae	
	Liparis sp.	8
	? (digested remains)	18
Myoxocephalus scorpioides n = 1	? (digested remains)	1
Triglops pingeli n = 1	Cottidae	5
	? (digested remains)	1
Lycodes mucosus n = 1	Zoarcidae	
	Lycodes mucosus	1
	Cottidae	2
	Myoxocephalus sp.	8
	? (digested remains)	1

(see chemical and physical measurements in Section 1). The species composition from the two locations is shown in Tables 6-4 and 6-5.

Species of fish known from Frobisher Bay and immediately adjacent coastal waters in Davis Strait (Table 6-9) include a total of 12 families consisting of 24 genera and 37 species. This list contains several species that are known by one or, at most, only a few specimens, usually from near the coastal region or found otherwise under exceptional circumstances. Examples are: *M. villosus*, *G. morhua*, *G. argentatus*, *Ammodytes* sp., *C. lumpus*, *H. platessoides* and *R. hippoglossoides*. These are all subarctic and temperate Atlantic water forms. Others could be added to this group by including some of those species taken just a little further offshore than the adjacent coastal water. The remaining species in the Table are common throughout Frobisher Bay and as well are largely common to eastern Canadian Arctic waters (Hildebrand 1948, Ellis 1962). The most notable missing species from the list is *Myoxocephalus quadricornis*. It is known from waters both to the north and to the south of Frobisher Bay, but not from Frobisher Bay itself. It is highly probable that a specimen will be found but the species is not abundant as it is throughout much of the Arctic. Its place seems to be taken by *M. scorpius*, although the two species are known to coexist elsewhere.

Of the 12 families listed, eight (*Gadidae*, *Zoarcidae*, *Stichaeidae*, *Lumpenidae*, *Cottidae*, *Agonidae*, *Cyclopteridae* and *Liparididae*) contain species that are either uncommon or unknown outside of Arctic waters. Of these eight families, only the *Zoarcidae* and the *Cyclopteridae* do not have pelagic larvae. Those which do produce pelagic larvae, largely occupy the shallow coastal and shelf waters.

LARVAL FISH

The results in Tables 6-4 and 6-5 and Fig. 6-2 show that numbers of fish varied between species, location, depth and night and day conditions, with the greatest densities occurring in samples taken from the shallower depths at night. The less numerous species, though not statistically tested, showed only small length differences of specimens between samples and none were found between night and day samples of *G. tricuspis* and *Icelus* sp. Differences in depth distributions between night and day are assumed to be associated with the vertical diurnal migration of the plankton and with feeding (see Section 3).

As far as the data show, there appear to be only minor differences in depth distributions within species. *G. tricuspis* (Fig. 6-2) shows more of a preference for deeper water than other species but maintains its principal daytime abundance near the 40 m depth level. At night, the major abundance occurs within 15 m of the surface. *Triglops* sp. and *Liparis* sp. are distributed down to about 45 m with a preference for the 15 to 30 m zone during the day and near-surface waters at night. The two other species collected in abundance, *M. scorpius* and *Icelus* sp.,

Table 6-9. Species of fish from Frobisher Bay and adjacent coastal Davis Strait waters.

Salmonidae	
Salvelinus alpinus	Arctic char
Osmeridae	
Mallotus villosus	capelin
Gadidae	
Boreogadus saida	Arctic cod
Gadus morhua	Atlantic cod
G. ogac	ogac cod
Gaidropsarus argentatus	silver rockling
Zoarcidae	
Gymnelis retrodorsalis	aurora unernak
G. viridis	fish doctor
Lycodes mucosus	saddled eelpout
L. pallidus	pale eelpout
L. polaris	polar eelpout
L. reticulatus	Arctic eelpout
Stichaeidae	
Stichaeus punctatus	Arctic shanny
Lumpenidae	
Anisarchus medius	stout eelblenny
Leptoclinus maculatus	daubed shanny
Lumpenus fabricii	slender eelblenny
L. lampretaeformis	snake blenny
Ammodytidae	
Ammodytes sp.	sand lance
Cottidae	
Artediellus scaber	rough hookear
Gymnocanthus tricuspis	Arctic staghorn sculpin
Icelus bicornis	twohorn sculpin
I. spatula	spatulate sculpin
Myoxocephalus scorpioides	Arctic sculpin
M. scorpius	shorthorn sculpin
Triglops murrayi	moustache sculpin
T. nybelini	bigeye sculpin
T. pingeli	ribbed sculpin
Agonidae	
Aspidophoroides olriki	Arctic alligatorfish
Leptagonus decagonus	Atlantic poacher
Cyclopteridae	
Cyclopterus lumpus	lumpfish
Eumicrotremus derjugini	leatherfin lumpsucker
E. spinosus	Atlantic spiny lumpsucker
Liparididae	
Liparis fabricii	gelatinous snailfish
L. gibbus	dusky snailfish
L. tunicatus	kelp snailfish
Pleuronectidae	
Hippoglossoides platessoides	Canadian plaice
Reinhardtius hippoglossoides	Greenland halibut

were found, though scarce, between 5 and 30 m during the day, and abundantly near the surface at night, decreasing with depth to 30 m. The remaining species occurred in such small numbers that depth distribution cannot be described except to state that few specimens were found deeper than 50 m, and that most were within the 0 to 20 m depth zone at night.

The samples also indicate major location preferences for the species. Collections of *G. tricuspis*, *A. olriki* and *L. decagonus* were almost totally from Brevoort Island waters while *Liparis* sp., *S. punctatus* and *M. scorpius* were dominant in Cornelius Grinnell Bay. *Icelus* sp., *Triglops* sp. and *L. maculatus* were approximately equal in density at both locations.

Den Beste and McCart (1978) presented a list of species from studies made in 1978 from the regions of Winton Bay, upper Cyrus Field Bay and the mouth of Frobisher Bay. The principal differences between the collections of 1978 and 1979 are in the occurrence of *B. saida*, *G. tricuspis* and *Icelus* sp. In 1978, *B. saida* young of the year were available in modest abundance (2.5 fish/1000 m^3) but completely missing from samples in this study. On the other hand, *G. tricuspis* and specimens of *Icelus* sp. were relatively abundant in 1979 but missing from the collections made in 1978. Studies conducted by MacLaren Atlantic Ltd. (1978b) reported not only *B. saida* and *Liparis* sp., which were common in the Brevoort and Cornelius Grinnell Bay area in 1978, in the ichthyoplankton of offshore water of Davis Strait, but also *Myoxocephalus* sp. The three species of *Myoxocephalus*, which are common to the eastern Canadian Arctic, are usually associated with shallow coastal waters and only rarely found at depth (*M. scorpius* down to about 200 m). The pelagic larvae of the deep water polar sculpin, *Cottunculus* sp., known to occur in offshore Davis Strait, could possibly have been misidentified as *Myoxocephalus*. MacLaren Atlantic Ltd. found *Ammodytes* larvae (sand lance) to be the most abundant offshore species but, with one exception, absent from the nearshore sampling locations. This species was absent from samples described by Den Beste and McCart (1978) and was also absent from samples collected in this study. Adult *Ammodytes* have not been described from the numerous benthic trawls previously made in Frobisher Bay nor, since it is a favourite food item of Arctic char, from the numerous stomach samples examined from the area (Grainger 1953).

The larval fish studies conducted in the general Frobisher-Brevoort-Davis Strait region have all been multidisciplinary and as a result have not been explicit in defining density distribution with depth. Abundance estimates have been made only on the basis of the number of fish larvae encountered in a filtered amount of water but these have not been integrated over the water column. Nevertheless, the increasing numbers of samples available from a range of depths display a similarity in abundance.

Summarized these are:

Source and year		Calculated mean number of larvae per 1000 m^3
MacLaren Atlantic Ltd.	1978a	46.0
Den Beste & McCart	1978	16.7
This study	1979	30.6

Major differences in densities occur. In Fig. 6-2 the individual sample differences are apparent, particularly between those taken during the day and during the night. However, since the real abundance of fish is expected to remain relatively constant, the differing densities are expected to be a function of migration.

The summation of the estimated catches of all species of fish from each 10-m depth contour of the water column down to a depth of 135 m for day catches and 85 m for night catches (Fig. 6-3) indicates a mean density of 28.6 fish per 1000 m^3 for day catches and 50.9 fish per 1000 m^3 for night catches. These estimates are close to those suggested by the average of numbers per volume of filtered water. Translated into abundance, numbers of larval fish per unit of water surface indicate 4.3 and 3.9 larvae per m^2 for night and day samples, respectively.

Samples of *B. saida*, which constituted 70.9% of the larval fish in samples from the southern Beaufort Sea had an estimated mean density of 1.81 fish per 1000 m^3 (Hunter, 1979). This, in terms of abundance for all species, amounted to 0.38 larval fish per m^2 or about one tenth that of the Brevoort area samples. Quast (1974) reported a depth weighted average of 28.0 per 1000 m^3 young of the year *B. saida* for the eastern Chukchi Sea which suggests a similarity of productivity to that of the Brevoort region. Higher productivity is indicated for the Lancaster Sound region where 67.7 and 37.6 *B. saida* larvae per 1000 m^3 has been reported by Sekerak et al. (1976).

Occasionally high densities of larval fish are observed and such incidence was reported from a northern arm of Shark Fiord near Pangnirtung on 10 August 1979 (personal communication from Dr. D. E. Sergeant and Dr. P. F. Brodie). Quantitative sampling gear was not available but estimates made by Dr. Brodie suggested a density of 55 fish per m^3 for the upper one metre only. A sample of seven specimens scooped from the water with a hand basin consisted of *M. scorpius*. This high density was prevalent throughout the area of the fiord examined and the incidence of fish larvae, at this time 55 000 per 1000 m^3, was considered sufficient to provide a suitable food base for baleen whales.

The mean length and length range of the larval fishes collected (Fig. 6-4) indicate the mean sizes of species, with the exception of *T. pingeli* and *L. fabricii*, are approximately similar. The figure also suggests that spawning for most species, especially for *L. fabricii*, may be over a protracted time interval since the standard deviation and range of length cover a wide size spectrum. Den Beste and McCart (1978)

questioned this same possibility for *L. koefoedi*. (*L. koefoedi* = *L. fabricii* in a recent taxonomic revision by McAllister and Able, in press). Small numbers of most species in the September samples suggest that specimens may have achieved sufficient size to lose their pelagic habit and take up benthic residence. Information on the size at which most species leave the pelagic community is not well defined but the following, drawn from Den Beste and McCart (1978) and this study, show the maximum lengths of different species still in the pelagic state and the date these were observed.

Species	Total length mm	Date observed
M. scorpius	30.0	14 Aug. 1978
G. tricuspis	22.2	13 Aug. 1979
Icelus sp.	27.0	16 Sept. 1979
Triglops sp.	48.0	5 Sept. 1978
A. olriki	18.2	7 Aug. 1979
L. maculatus	21.4	16 Sept. 1979
L. decagonus	19.4	13 Aug. 1979
S. punctatus	14.1	8 Aug. 1979

It is of note that MacLaren Atlantic Ltd. (1978) did not find any fish larvae in their November and December samples from the water offshore and at the southern tip of Frobisher Bay.

The growth of larval fish throughout the summer (Fig. 6-5) is very similar in the species of sculpins, *M. scorpius* and *G. tricuspis*, and differs only slightly for *T. pingeli* and *Icelus* sp. The growth of the species shown has been extrapolated both to smaller and larger lengths which, based upon the probable length of the larvae at the time of hatching or by the egg size given in the literature, suggests a mean hatching date close to mid June. Similarly, the date at which they become benthic dwellers is suggested by their growth rate and the minimum size at which they have been found on the bottom. Andriashev (1954) reported 22 mm for *M. scorpius* although specimens of 30.0 mm were found in the pelagic phase (Den Beste and McCart 1978). The absence in the September samples of specimens of a species which had been present in the July and August samples provides some clue as to the date and possible mean length when they adopt the benthic habit.

Stomach contents of larval fish have been described in Section 3 by Grainger. It is of particular note that some fish larvae rapidly develop large mouths with their increase in size. This feature is shown in Fig. 6-8 for eight species and is well illustrated in Fig. 6-9 in the sample of *M. scorpius* with another sculpin in its mouth. The extent or impact of cannibalism is unknown.

JUVENILE AND ADULT FISHES

Catch effort for fish other than larval in this study was small. Nevertheless the catch and catch per unit of effort (Table 6-6) clearly

indicate that the dominant species available to gill nets was *M. scorpius* and, further, that no exceptionally great abundance was present. Results equate to those reported by Den Beste and McCart (1978). Trawl and dredge samples (Table 6-7) also indicate a low abundance of benthic fishes. The relative numbers of fish and the size range of the fish caught by dredge and by trawl (Fig. 6-6) strongly suggest that neither piece of fishing gear causes alarm among the species caught and that the fish make little or no attempt to avoid the gear.

Scuba divers in the 1978 study (Den Beste and McCart 1978) reported many small specimens were to be observed in rock crevices and under dense vegetative cover. Semi-quantitative observations indicated densities of fish between 0.1 and 0.5 fish per m^2 or about 10 times greater than that indicated in dredge and trawl hauls. However, the larger specimens of sculpins (>150 mm) showed little disturbance by the divers' presence. The smaller species as well as the smaller specimens of all species might also avoid the trawl or dredge differentially. The relative density of different species can thus be expected to be biased by their size difference, particularly on hard bottoms where appropriate cover is available.

Age-length relationships of *M. scorpius*, *G. tricuspis*, *I. spatula* and *T. pingeli* (Fig. 6-7) are possibly distorted towards the faster growing specimens by the sampling bias of the fishing gear. The best growth relationships, not shown here, are those in which size at age has been back-calculated from older specimens. For the most part, few specimens of sculpins exceed 7 years of life and growth is largely complete at this time. Single specimens of 13 and 14 year old *M. scorpius* were obtained in the sample but specimens older than 7 years were rare.

Mortality rate (M) as the annual natural mortality rate is indicated by the age class composition, where:

$$M = 1 - \frac{\text{Number Age}_{n+1}}{\text{Number Age}_{n}}$$

For the years 1978, 1979 and combined 1978 and 1979 the mortality rate for *M. scorpius* is as follows:

Age (yrs)	Sample n(1978)	M(1978)	Sample n(1979)	M(1979)	Sample n(1978 + 1979)	Sample M(1978 + 1979)
4	21		12		33	
5	20		41		61	
6	13	30.8	29	65.5	42	54.8
7	9	44.4	10	60.0	19	52.6
8	5	20.0	4	100.0	9	55.6
9	4		0		4	

Samples of *G. tricuspis* indicate a very high rate of mortality after age 5 when sample numbers decreased from 44 specimens at age 5 to 2 specimens at age 6, for an apparent loss of over 95%. Samples obtained

from other species are too few to provide estimates of mortality but it is fair to note that the longevity for *I. spatula* and *T. pingeli* of only 5 years would dictate a rate of mortality that would be high for Arctic species of fish.

No evidence exists from the age composition of *G. tricuspis* to indicate that missing year classes occur. Such variation was suggested from the dominant numbers of larvae observed in this year's samples compared to their complete absence in 1978.

A complete analysis of the stomach contents of the non-larval fish has not been carried out but the fish-predator fish-prey relationship (Table 6-8) indicates a high interdependence within the same trophic level. It is of interest to note that none of the *G. tricuspis* nor *Icelus* sp. contained fish in their stomachs.

SUMMARY AND CONCLUSIONS

Sampling for distribution and abundance of pelagic larval fish off Baffin Island has proved difficult because of poor weather and ice conditions. Yet in spite of this a positive picture of the importance of the nearshore environment to larval fishes emerges.

An overall abundance for the region is derived that parallels other estimates and is in keeping with the order of other biological productivity measurements.

The depth density distribution of species is defined, particularly between night and day samples.

The time during which different species occur in the pelagic phase is broadly indicated.

The observation that year class successes and failures of major proportions may occur between species is documented in the record of different species occurrences in successive years.

Further detail with respect to the behaviour of benthic fishes to fishing gear is provided.

Natural mortality of a few species is considered and some food web interdependence within the trophic level is shown.

The fish species composition of the nearshore environment and within Frobisher Bay is shown to be principally that of an Arctic type. Occasional occurrence of Atlantic type species, particularly of juvenile or larval forms, suggest that Atlantic water sometimes penetrates into the area, even to the head or western extremity of Frobisher Bay.

If an oil mishap were to occur in an appropriate offshore position it could similarly penetrate into the waters near Brevoort Island or along the

southeastern Baffin Island coast and into Frobisher Bay. Should this happen, the fish would be affected. Probably the first to feel the impact would be the larval forms that concentrate in the near surface water during the night. However, the period of sensitivity is likely to be only from the time of ice break-up until September. Unless extensive coastal areas are affected by the same mishap, rapid replacement of the stock would be expected since the eggs and larvae are pelagic.

Adult fish may be affected directly by oil but they would also suffer through the effect of oil on the food web. Any temporary calamity would not be expected to have lasting effects. Damage to the fish stocks would be mitigated in successive years with major recovery in 5 to 7 years.

B. saida and *M. scorpius* are occasionally used for food but no Arctic fish species from Brevoort Island waters forms a major item of direct use to man.

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7. Summary

Davis Strait coastal waters off southeast Baffin Island are predominantly arctic with variable West Greenland intrusions. Data obtained in 1979 showed no clear physical evidence of Atlantic mixing, but provided some biological indications of warm-water influence, especially near and on the bottom at the deepest stations.

Of the nutrients measured, only nitrate was depleted, only in the upper 10 m and only at some stations. At these locations, nitrate depletion may have had a limiting effect on phytoplankton activity. At other stations, all nutrients were available in the euphotic zone, and light and temperature, the former in the deeper water and the latter nearer the surface, appeared to be the main factors controlling phytoplankton production.

Phytoplankton standing stocks ranged from 5 to 2190 X 10^3 cells per litre, or from 1.5 to 3.2 X 10^{10} cells beneath a square metre. Phytoplankton consisted of 66 diatom species, 4 species each of flagellates and dinoflagellates, and a single chrysophyte species. Multispecific blooms occurred at nearshore stations and a monospecific bloom at the station farthest off shore. *In situ* primary production as high as 7.98 mg C per m^3 per hour, or 203 mg C under a square metre per hour was measured, indicating a relatively high rate of plant productivity compared with measurements made elsewhere in Canadian arctic waters.

The zooplankton consisted of 74 mainly arctic species, but included a few warm-water forms, indicating a small Atlantic water influence. The herbivorous zooplankton stocks ranged from around 60 to more than 300 mg (wet weight) per m^3. A few species (mainly copepods *Metridia*, *Calanus* and *Pseudocalanus*) underwent diurnal vertical migration and supplied an important concentration of food for young fishes near the surface at night.

The primarily and partly carnivorous zooplankton amounted to roughly 10% of the weight of the mainly plant-feeding component. A few groups of these organisms accounted for more than 90% of the energy in this category. In shallow water, most of the energy was accounted for by mysids, coelenterates, hyperiid amphipods and ctenophores, and in the deeper water by coelenterates, chaetognaths and hyperiids. *Mysis oculata* underwent dramatic diurnal vertical migration and contributed substantially to the available fish food supply near the surface at night.

Another component of the food web exists within the sea ice, and includes several copepods and young amphipods. It is probable that these small animals feed on plants within the ice and are fed upon in turn by larger animals which appear to feed on the lower surface of the ice. All the ice species are fully planktonic under ice-free conditions; obviously they are adapted to living with the ice or without it. They are evidently a source of food to animals beneath the ice, and thus appear to fill an important role in the ice-based late winter-spring food web.

The pelagic larvae of a number of fishes formed an important part of the system. The sculpins *Gymnocanthus tricuspis* and *Triglops pingeli* were the most abundant, along with smaller numbers of the sculpins *Myoxocephalus scorpius* and *Icelus* sp. The seasnail *Liparis* sp., the alligatorfish *Aspidophoroides olriki*, the sea poacher *Leptagonus decagonus* and the prickleback *Stichaeus punctatus* were the other larval fishes found.

An important feature of the larval fishes was their diurnal vertical migration, which resulted in the concentration of young fishes in the surface water at night (50.9 fishes per 1000 m^3 at night and 28.6 fishes per 1000 m^3 during daytime). The young fishes appear to have fed heavily and largely non-selectively (other than on the basis of size limitations) in the near-surface waters at night. Post-larval pelagic fish (the arctic cod, *Boreogadus saida*) appear also to feed mainly on vertically migrating invertebrates. There is evidence that pelagic fish larvae appear in the water column at about the time the zooplankton reaches maximum summer concentrations, and that their autumn disappearance coincides with the decline in zooplankton at that time of the year.

The infaunal benthos from grab collections varied in dry weight biomass from 6 to 42 g per m^2 and included from 38 to 159 species in each haul. The epifaunal benthos from dredge collections averaged about 0.5 g per m^2 (dry) and added 28 species to the grab-caught total to give 286 species in all. Seven of these were bottom fishes. Most of the invertebrates are well known from other parts of the eastern Canadian arctic.

At the deeper stations (more than 25 m), 10% of the species accounted for about 90% of the benthic biomass. In less than 25 m, there were fewer species in all, and 20% of the species represented only about 80% of the biomass.

8. Recommendations

Anticipating probable continued use of the Brevoort Island site in conjunction with further drilling operations in Davis Strait, including possible shipping activity, port development, fuel transfer and storage, we attach several recommendations for further research. These are directed towards identifying immediate effects and predicting longer term consequences of oil on the marine environment in the vicinity of Brevoort Island.

1. We recommend extension of the study of seasonal cycles of plankton composition, distribution and production in Brevoort Harbour and nearby waters. This will allow continued examination for major limiting factors, such as effects of illumination, temperature and nutriment on production under various conditions found in the localities studied. This involves a continuing search for natural controls on the system, a pre-requisite for identifying and predicting man-induced influences.

2. The question of what eats what is only beginning to be answered in such locations as Brevoort Harbour. Its importance lies in the need to define energy pathways through the system, partly in order to show the extent to which optional routes may or may not be available. Again, the natural variations must be defined in order to assess man-induced influences. To this end, additional studies on feeding and nutrient values throughout the system should be carried out.

3. Fishes form a major link in the food chain between invertebrates and mammals. Better estimates of abundance and diversity are required on both the pelagic and benthic fish species, in various depths and over a range of substrates. Many species produce pelagic young. Abundance, growth, distribution and feeding of the pelagic larvae require additional study, including examination of year-to-year variations.

4. Additional sea ice studies are required in order to confirm the role of the ice biota in a wider trophic scheme. It is necessary to determine the degree to which events in the water are dependent on the ice, in order to predict the consequences of disturbance of the ice biota.

5. Benthic invertebrates provide the major source of food for the bottom-dwelling fishes, the dominant adult fish group in Brevoort Harbour and nearby waters. Expanded work is recommended on faunal composition, especially at additional depths, and on the role of benthic invertebrates as food for vertebrate predators.

6. There is a need, following the brief study of 1979, for extended quantitative description of the temperature-salinity-nutrient cycles in Brevoort Harbour and vicinity, to cover at least the spring-to-autumn period. This, especially if extended longer than a year, would serve to determine whether or not significant variations occur in the degree of influence of offshore conditions (and events) on the waters near shore.

Appendix I

Table I-1. Station 79-A, 8 Aug., 1000 hours AST, 33 m total depth. Air temp. 9.0°C. Sea 0.6 m. Wind south, 7 knots. Weather haze, fog.

Depth (m)	Temp. (°C)	Salinity (°°/₀)	Oxygen (mL/L)	NO_2-N	NO_3-N	NH_3-N	PO_4-P	SiO_3-Si
						(µg-at/L)		
0	2.80	31.775	8.95	0.07	1.82	0.58	0.52	1.67
1	2.24	31.987	9.24	0.00	1.25	0.42	0.41	0.49
3	1.02	32.411	9.49	0.04	3.37	0.51	0.59	3.04
5	0.22	32.737	10.05	0.05	1.82	0.74	0.44	2.16
7	0.03	32.891	9.22	0.05	3.79	0.61	0.54	3.73
10	-0.18	32.930	8.72	0.02	2.17	2.30	0.51	3.14
20	-0.31	33.000	8.36	0.14	3.45	1.34	0.59	3.64
30	-0.51	33.047	8.23	0.01	4.06	0.83	0.69	4.81

Table I-2. Station 79-A, 13 Aug., 1020 hours AST, 36 m total depth. Air temp. 9.5°C. Sea 0.1 m. Wind north, 5 knots. Weather sunny.

Depth (m)	Temp. (°C)	Salinity (°°/₀)	Oxygen (mL/L)	NO_2-N	NO_3-N	NH_3-N	PO_4-P	SiO_3-Si
						(µg-at/L)		
0	0.60	33.008	8.68	0.07	1.95	0.80	0.66	4.10
1	0.70	33.062	8.61	0.02	1.92	1.09	0.63	4.41
3	-0.45	33.090	8.46	0.06	2.20	1.69	0.69	4.84
5	-0.42	33.102	8.41	0.04	2.36	0.93	0.68	5.16
7	-0.47	33.117	8.30	0.03	3.35	1.09	0.73	5.48
10	-0.58	33.134	8.21	0.06	3.05	1.09	0.72	4.73
20	-0.48	33.123	8.24	0.04	4.41	1.09	0.84	6.86
30	-0.57	33.128	8.09	0.02	4.75	1.18	0.86	7.18

Table I-3. Station 79-B, 6 Aug., 1530 hours AST, 13 m total depth. Air temp. 7.5°C. Sea ripples. Wind variable, light. Weather overcast.

Depth (m)	Temp. (°C)	Salinity (°°/₀)	NO_2-N	NO_3-N	NH_3-N	PO_4-P	SiO_3-Si
					(µg-at/L)		
0	3.21	31.857	0.00	0.00	1.25	0.25	0.00
1	3.13	31.869	0.01	0.00	0.83	0.19	0.39
3	2.49	32.075	0.00	0.00	0.70	0.28	0.88
5	2.17	32.154	0.01	0.06	0.89	0.27	0.20
7	1.90	32.407	0.00	1.81	0.86	0.47	2.45
10	1.34	32.706	0.00	1.02	0.73	0.45	0.88
12	0.15	32.788	--	--	--	--	--

Table I-4. Station 79-C, 12 Aug., 1000 hours AST, 77 m total depth. Air temp. 8.5°C. Sea calm. Wind calm. Weather cloudless.

Depth (m)	Temp. (°C)	Salinity (°°/₀)	Depth (m)	Temp. (°C)	Salinity (°°/₀)
0	0.60	33.090	20	-0.68	33.133
1	-0.40	33.098	30	-0.72	33.134
3	-0.47	33.091	40	-0.79	33.180
5	-0.59	33.081	50	-0.83	33.159
7	-0.52	33.082	70	-0.80	33.163
10	-0.58	33.098			

Table I-5. Station 79-D, 5 Aug., 1145 hours AST, 162 m total depth. Air temp. 7.0°C. Sea 0.7 m. Wind south, 10 knots. Weather 3/8 cloud.

Depth (m)	Temp. (°C)	Salinity (°°/₀)	Oxygen (mL/L)	NO_2-N	NO_3-N	NH_3-N (µg-at/L)	PO_4-P	SiO_3-Si
0	0.69	31.838	9.31	0.00	0.14	1.54	0.41	1.88
1	0.60	31.918	9.29	0.00	0.09	1.09	0.32	1.88
3	0.50	31.926	9.41	0.03	0.17	1.34	0.61	1.98
5	0.23	32.833	9.59	0.00	0.24	1.79	0.61	2.56
7	0.16	32.834	9.55	0.00	0.24	1.69	0.53	2.56
10	0.03	32.854	9.58	0.00	0.49	1.15	0.48	3.33
19	-0.12	32.881	9.31	0.00	0.72	1.18	0.51	3.91
28	-0.33	32.908	9.04	0.00	1.38	1.69	0.57	4.20
36	-0.53	32.857	9.38	0.00	1.55	2.14	0.49	3.24
44	-0.56	32.944	8.92	0.00	2.27	2.97	0.61	5.94
93				0.04	4.26	6.04	0.74	7.29
126				0.03	8.08	7.76	0.97	10.39

Table I-6. Station 79-E, 11 Aug., 0915 hours AST, 245 m total depth. Air temp. 5.0°C. Sea calm. Wind variable, light. Weather cloudless.

Depth (m)	Temp. (°C)	Salinity (°°/₀)	Depth (m)	Temp. (°C)	Salinity (°°/₀)
0	0.40	32.992	30	-0.59	33.124
1	0.12	32.977	40	-0.62	33.125
3	-0.26	32.979	50	-0.67	33.137
5	-0.36	33.026	100	-1.1	33.183
7	-0.32	33.058	200	-1.2	33.376
10	-0.30	33.074	230	-1.2	33.383
20	-0.51	33.106			

Table I-7. Station 79-F-e, 21 July, 1320 hours AST, 35 m total depth. Air temp. 3.0°C. Sea 0.3 m. Wind southeast, 6 knots. Weather overcast.

Depth (m)	Temp. (°C)	Salinity (°°/₀)	Oxygen (mL/L)	NO_2-N	NO_3-N	NH_3-N	PO_4-P	SiO_3-Si
						(µg-at/L)		
0	2.3	29.710	9.58	0.19	0.00	3.29	0.31	2.20
1	2.2	29.723	9.67	0.04	0.00	3.99	0.22	1.50
3	1.4	30.542	9.70	0.12	0.20	1.50	0.28	1.20
5	1.2	30.909	10.33	0.12	0.00	2.36	0.32	2.00
7	0.7	31.615	10.47	0.03	0.03	4.79	0.33	2.00
10	-0.8	32.769	9.81	0.00	0.19	3.99	0.40	2.20
20	-1.2	33.046	8.63	0.00	2.81	5.50	0.71	5.01
30	-1.0	33.071	8.22	0.00	2.78	4.95	0.67	5.91

Table I-8. Station 79-F-e, 18 Sept., 1000 hours AST, 55 m total depth. Air temp. 2.0°C. Sea 0.5 m. Wind north, 9 knots. Weather overcast.

Depth (m)	Temp. (°C)	Salinity (°°/₀)	Oxygen (mL/L)
0	0.4	23.665	7.97
1	0.4	26.524	7.81
3	0.2	29.216	7.92
5	0.1	--	7.83
7	0.1	30.466	7.79
10	0.0	32.358	7.78
20	0.0	--	7.63
30	-0.2	32.133	7.50
40	-0.2	--	7.43

Table II-1. Quantitative composition and vertical distribution of phytoplankton in east Baffin Island waters at Station A, 8 August 1979.

Depth (m)	0	1	3	5	7	10	20	30
Temperature (°C)	2.80	2.24	1.02	0.22	0.03	-0.18	-0.31	-0.51
Salinity (°/₀₀)	31.78	31.99	32.41	32.74	32.89	32.93	33.00	33.05
Total phytoplankton (X10³ cells/litre)	1170	355	754	1277	1236	1159	991	430
Bacillariophyta	1169	354	752	1276	1235	1159	989	429
Centrales	1075	337	675	1190	1097	954	920	345
Actinocyclus	-	-	-	-	-	-	+	+
A. normani	-	-	-	-	-	-	+	-
A. subtilis	-	-	-	-	-	-	-	+
Bacterosira	-	-	-	-	9	22	4	2
B. fragilis	-	-	-	-	9	22	4	2
Chaetoceros	459	276	623	1056	927	709	837	307
C. borealis	54	-	-	-	-	-	-	-
C. debilis	42	-	-	-	-	-	-	-
C. decipiens	-	22	-	96	108	24	42	13
C. fragilis	200	132	414	402	390	367	324	164
C. furcellatus	60	22	79	120	132	222	306	82
C. septentrionalis	5	-	6	30	+	+	36	8
C. socialis	-	14	10	102	69	66	9	-
C. wighami	62	58	60	192	72	+	54	16
C. spp.	36	28	54	114	156	30	66	24
Coscinodiscus	1	+	-	+	1	+	+	1
C. kuetzingii	1	+	-	+	1	+	+	1
C. polyacanthus	-	+	-	+	+	-	+	+
Detonula	6	9	14	18	38	12	-	-
D. confervacea	6	9	14	18	38	12	-	-
Eucampia	1	2	-	-	-	3	-	3
E. groenlandica	-	2	-	-	-	-	-	3
E. zodiacus	1	-	-	-	-	3	-	-

Table II-1. (cont'd.)

Depth (m)	0	1	3	5	7	10	20	30
Melosira								
M. arctica	2	-	1	-	1	-	-	-
Porosira	2	-	1	-	1	-	-	-
P. glacialis	-	2	-	2	6	3	2	+
Thalassiosira	-	2	-	2	6	3	2	+
T. bioculatus	53	36	33	109	117	217	77	25
T. decipiens	-	+	-	+	5	6	+	+
T. gravida	4	1	-	10	8	5	-	-
T. nordenskioldii	28	20	16	39	55	107	19	13
T. spp.	21	15	7	60	49	99	43	1
Unidentified Pennales	-	-		-	-	-	15	11
Achnanthes	5	12	4	5	7	10	4	9
A. brevipes	94	17	77	86	138	205	69	84
Amphipleura	+	-	-	-	-	-	-	-
A. rutilans	+	-	-	-	-	-	-	-
Amphora	-	-	-	-	+	-	-	-
A. spp.	-	-	-	-	+	-	-	-
Cocconeis	-	-	-	+	-	-	-	-
C. costata	-	-	-	+	-	-	-	-
C. placentula	4	+	1	2	1	1	2	1
C. scutellum	2	+	1	-	-	1	2	1
C. scutellum var. *stauroneiformis*	-	-	-	-	-	-	+	
Diploneis	1	-	-	1	-	-	-	-
D. incurvata	1	+	-	1	1	-	-	-
D. smithii	-	-	-	+	-	+	-	-
D. vacillans	-	-	-	+	-	-	-	-
D. spp.	-	-	-	-	-	+	-	-
Fragilariopsis	1	-	-	+	-	-	-	-
**F. oceanica*	-	-	-	+	-	-	-	-
	30	8	18	23	55	105	27	31
	30	8	18	23	55	105	27	31

*Now *Nitzschia grunowii*

Table II-1. (cont'd.)

Depth	0	1	3	5	7	10	20	30
Gomphonema	+	-	-	-	-	-	-	-
G. exiguum	+	-	-	-	-	-	-	-
Licmophora	1	-	-	-	-	-	-	-
L. glacilis var. *anglica*	1	-	-	-	-	-	-	-
Navicula	42	1	53	28	49	37	15	7
N. directa	-	-	-	-	+	-	-	-
N. distans	+	-	-	-	-	-	-	-
N. kariana	-	-	1	+	-	-	+	-
N. pelagica	-	1	40	23	38	22	9	6
N. superba	-	-	-	+	-	-	-	-
N. transitans	+	-	-	-	-	-	-	-
N. transitans var. *derasa*	-	+	-	-	-	-	-	-
N. transitans var. *incudiformis*	-	-	+	-	-	-	-	-
N. vanhoeffenii	42	-	12	2	11	15	6	1
N. spp.	-	-	-	3	-	-	-	-
Nitzschia	4	5	1	28	18	50	11	33
N. cylindrus	2	1	1	15	2	44	8	33
N. frigida	-	1	-	-	2	2	-	-
N. laevissima	-	-	-	-	-	-	+	-
N. linearis	+	-	-	-	-	-	-	-
N. longissima	-	1	-	-	-	-	-	-
N. polaris	1	-	-	+	-	-	+	-
N. seriata	1	2	-	13	14	4	3	-
Pleurosigma	-	-	-	-	-	+	-	-
P. cuspidatum	-	-	-	-	-	+	-	-
Rhabdonema	-	-	+	-	-	-	-	-
R. minutum	-	-	+	-	-	-	-	-
Synedra	-	-	-	+	-	-	-	-
S. tabulata	-	-	-	+	-	-	-	-

Table II-1. (cont'd.)

Depth	0	1	3	5	7	10	20	30
Tropidoneis	-	-	-	-	1	-	-	-
T. maxima	-	-	-	-	1	-	-	-
Unidentified	12	3	4	5	15	12	14	12
Chlorophyta	-	-	-	1	1	-	1	1
Cateria	-	-	-	-	-	-	1	-
C. sp.	-	-	-	-	-	-	1	-
Unidentified	-	-	-	1	1	-	-	1
Euglenophyta	1	-	-	-	-	-	-	-
Euglena	1	-	-	-	-	-	-	-
E. sp.	1	-	-	-	-	-	-	-
Pyrrophyta	-	1	1	-	-	-	1	-
Gymnodinium	-	-	1	-	-	-	-	-
G. sp.	-	-	1	-	-	-	-	-
Peridinium	-	1	-	-	-	-	1	-
P. sp.	-	1	-	-	-	-	1	-
Unidentified cysts	-	-	1	-	-	-	-	-

Table II-2. Quantitative composition and vertical distribution of phytoplankton in east Baffin Island waters at Station B, 6 August 1979.

Depth (m)	0	1	3	5	7	10	12
Temperature (°C)	3.21	3.13	2.49	2.17	1.90	1.34	0.15
Salinity (°/$_{oo}$)	31.86	31.87	32.08	32.15	32.41	32.71	32.79
Total phytoplankton (X10^3 cells/litre)	1367	917	893	1241	746	2190	1405
Bacillariophyta	1365	916	890	1237	742	2183	1404
Centrales	1158	824	796	1137	697	2048	1303
Actinocyclus	-	+	-	-	-	-	-
A. normani	-	+	-	-	-	-	-
Bacterosira	-	-	1	2	14	-	3
B. fragilis	-	-	1	2	14	-	3
Chaetoceros	1059	741	693	992	630	1893	1030
C. decipiens	78	87	27	30	30	289	133
C. fragilis	306	213	279	330	156	528	330
C. furcellatus	96	141	75	186	87	121	132
C. septentrionalis	9	6	6	2	6	13	9
C. socialis	507	183	168	327	207	798	279
C. wighami	36	51	69	24	57	21	21
C. spp.	27	60	69	93	87	123	126
Coscinodiscus	+	-	+	1	-	-	1
C. kuetzingii	+	-	+	1	-	-	1
C. polyacanthus	-	+	+	+	-	-	-
C. radiatus	-	-	-	-	+	+	-
Coscinosira	-	-	-	-	8	-	3
C. polychorda	-	-	-	-	8	-	3
Detonula	6	7	24	1	1	55	21
D. confervacea	6	7	24	1	1	55	21
Eucampia	-	1	3	7	4	7	6
E. groenlandica	-	1	3	3	-	1	6
E. zodiacus	-	-	-	4	4	6	-

Table II-2. (cont'd.)

Depth (m)	0	1	3	5	7	10	12
Leptocylindrus	-	-	-	-	-	-	3
L. danicus	-	-	-	-	-	-	3
Porosira	-	1	-	-	-	+	1
P. glacialis	-	1	-	-	-	+	1
Thalassiosira	86	63	69	121	26	83	220
T. bioculatus	+	-	-	4	-	-	-
T. decipiens	+	+	-	-	-	-	15
T. gravida	64	19	23	30	17	49	103
T. nordenskioldii	16	38	36	87	9	28	102
T. spp.	6	6	10	-	-	6	-
Unidentified	7	11	6	13	14	10	18
Pennales	207	92	94	100	45	135	101
Achnanthes	3	-	-	-	-	-	-
A. taeniata	3	-	-	-	-	-	-
Cocconeis	2	2	2	+	+	1	3
C. costata	1	2	1	-	+	1	-
C. scutellum	1	-	1	+	+	-	3
Diploneis	-	-	+	-	-	-	-
D. smithii	-	-	+	-	-	-	-
D. vacillans	-	-	+	-	-	-	-
Fragilariopsis	104	57	45	55	7	112	7
**F. oceanica*	104	57	45	55	7	112	7
Licmophora	-	+	-	+	-	2	-
L. gracilis	-	+	-	+	-	2	-
Navicula	2	6	27	30	18	4	26
N. kariana	+	1	-	+	+	-	-
N. pelagica	-	3	24	30	18	4	26
N. vanhoeffenii	-	2	-	-	-	-	-
N. spp.	2	-	3	-	-	-	-

*Now *Nitzschia grunowii*

Table II-2. (cont'd.)

Depth (m)	0	1	3	5	7	10	12
Nitzschia	85	10	14	9	11	9	43
N. brebissonii	-	-	-	-	-	2	-
N. cylindrus	80	9	2	6	6	2	37
N. lecointei	-	-	-	-	-	1	-
N. longissima	-	1	-	-	-	1	-
N. polaris	-	-	2	-	-	-	-
N. seriata	5	-	10	3	5	3	6
Pleurosigma	+	-	-	-	-	-	-
P. cuspidatum	+	-	-	-	-	-	-
Unidentified	11	17	6	6	9	7	22
Pyrrophyta	2	1	3	4	4	7	1
Gymnodinium	-	-	-	1	-	-	-
G. sp.	-	-	1	1	-	-	-
Minuscula	-	-	-	-	-	-	-
M. bipes	-	-	1	-	-	-	-
Peridinium	-	-	-	-	1	2	-
P. sp.	-	-	-	-	1	2	-
Unidentified	2	1	2	3	3	5	1

Table II-3. Quantitative composition and vertical distribution of phytoplankton in east Baffin Island waters at Station C, 12 August 1979.

Depth (m)	0	1	3	5	7	10	20	30	40	50	70
Temperature (°C)	0.60	-0.40	-0.47	-0.59	-0.52	-0.58	-0.68	-0.72	-0.79	-0.83	-0.80
Salinity (°/₀₀)	33.09	33.10	33.09	33.08	33.08	33.10	33.13	33.13	33.18	33.16	33.16
Total phytoplankton ($X10^3$ cells/litre)	622	551	404	444	445	390	430	390	326	280	213
Bacillariophyta	621	550	404	439	441	373	424	384	319	278	209
Centrales	612	538	376	424	392	311	386	359	310	268	189
Bacterosira	-	-	2	-	-	-	-	2	-	-	-
B. fragilis	-	-	2	-	-	-	-	2	-	-	-
Chaetoceros	598	491	301	354	352	280	336	342	289	246	169
C. decipiens	54	48	19	12	12	10	15	12	23	13	7
C. fragilis	366	240	100	152	196	184	148	170	73	129	45
C. furcellatus	63	132	61	158	84	38	108	111	94	61	103
C. karianus	-	-	-	-	+	-	-	-	-	-	-
C. septentrionalis	4	6	2	1	-	-	2	-	7	-	1
C. socialis	60	15	72	7	-	-	-	8	-	-	-
C. wighami	-	-	19	5	12	14	5	-	32	16	3
C. spp.	51	50	28	19	48	34	58	41	60	27	10
Coscinodiscus	-	-	1	+	-	+	1	-	-	+	+
C. kuetzingii	-	-	1	-	-	+	1	-	-	-	-
C. lacustris var. *septentrionalis*	-	-	-	-	-	+	+	-	-	+	+
C. polyacanthus	-	-	-	+	-	-	-	-	-	+	-
Coscinosira	-	-	2	-	-	-	-	-	-	-	-
C. polychorda	-	-	2	-	-	-	-	-	-	-	-
Detonula	2	17	9	-	7	5	-	-	4	6	4
D. confervacea	2	17	9	-	7	5	-	-	4	6	4
Eucampia	-	-	-	-	-	-	13	1	4	-	-
E. groenlandica	-	-	-	-	-	-	-	1	-	-	-
E. zodiacus	-	-	-	-	-	-	13	-	4	-	-

Table II-3. (cont'd.)

Depth (m)	0	1	3	5	7	10	20	30	40	50	70
Porosira	+	+	+	+	+	+	-	-	+	+	+
P. glacialis	+	+	+	+	+	+	-	-	+	+	+
Thalassiosira	4	28	46	58	23	21	29	9	3	12	10
T. decipiens	+	+	+	-	-	-	-	-	-	-	-
T. gravida	3	8	14	19	8	11	19	7	2	6	1
T. nordenskioldii	1	20	32	39	4	10	7	-	1	3	+
T. spp.	+	+	+	+	11	-	3	2	-	3	9
Unidentified	8	2	15	12	10	5	7	5	10	4	6
Pennales	9	12	28	15	49	62	38	25	9	10	20
Cocconeis	-	+	1	-	-	1	1	-	-	-	-
C. Costata	-	+	1	-	-	1	1	-	-	-	-
Fragilariopsis	2	-	28	-	30	-	1	-	-	1	+
**F. oceanica*	2	-	28	-	30	-	1	-	-	1	+
Licmophora	-	-	-	-	-	-	-	-	-	-	+
L. gracilis	-	-	-	-	-	-	-	-	-	-	+
Navicula	1	3	-	8	2	10	26	22	5	+	10
N. kariana	-	-	-	-	-	-	+	-	-	-	1
N. pelagica	-	3	-	8	-	10	26	21	4	-	9
N. transitans var. *derasa*	-	-	-	-	-	-	-	-	-	+	-
N. vanhoeffenii	1	-	-	-	-	-	-	-	-	-	-
N. spp.	-	-	-	-	2	-	-	1	1	-	-
Nitzschia	2	5	-	1	12	49	4	1	3	7	9
N. cylindrus	1	-	-	1	12	45	-	1	2	-	3
N. frigida	-	2	-	-	-	-	4	-	-	2	-
N. longissima	-	1	-	-	-	-	-	-	1	1	-
N. polaris	1	-	-	-	-	-	-	-	-	-	-
N. seriata	-	2	-	-	-	4	-	-	-	4	6
Unidentified	4	4	-	6	5	2	6	2	1	2	1

*Now *Nitzschia grunowii*

Table II-3. (cont'd.)

Depth	0	1	3	5	7	10	20	30	40	50	70
Chlorophyta	1	1	-	3	1	5	1	1	-	-	2
Carteria	1	1	-	3	1	5	1	1	-	-	2
C. sp.	1	1	-	3	1	5	1	1	-	-	2
Pyrrophyta	-	-	-	2	3	12	5	5	7	2	2
Exuviella	-	-	-	-	-	2	-	-	-	-	-
E. marina	-	-	-	-	-	2	-	-	-	-	-
Gymnodinium	-	-	-	-	3	8	2	2	5	-	1
G. sp.	-	-	-	-	3	8	2	2	5	-	1
Minuscula	-	-	-	-	-	1	-	-	-	-	-
M. bipes	-	-	-	-	-	1	-	-	-	-	-
Oxytoxum	-	-	-	1	-	-	-	-	-	-	-
O. sp.	-	-	-	1	-	-	-	-	-	-	-
Peridinium	-	-	-	1	-	-	2	2	1	2	-
P. sp.	-	-	-	1	-	-	2	2	1	2	-
Unidentified	-	-	-	-	-	1	1	1	1	-	1

Table II-4. Quantitative composition and vertical distribution of phytoplankton in east Baffin Island waters at Station D, 5 August 1979.

Depth (m)	0	1	3	5	7	10	20	30	40	50	100	130
Temperature (°C)	0.69	0.60	0.50	0.23	0.16	0.03	-0.12	-0.33	-0.53	-0.56		
Salinity (°/₀₀)	31.84	31.92	31.93	32.83	32.83	32.85	32.88	32.91	32.86	32.94		
Total phytoplankton (X10³ cells/litre)	558	216	402	542	732	475	449	362	299	209	157	91
Bacillariophyta	556	214	400	541	726	468	449	340	294	208	155	85
Centrales	434	182	384	477	651	426	345	205	233	94	116	37
Bacterosira	-	-	-	5	2	3	3	-	-	-	-	-
B. fragilis	-	-	-	5	2	3	3	-	-	-	-	-
Chaetoceros	353	157	328	416	553	397	253	135	163	69	48	27
C. decipiens	12	2	14	34	+	12	21	4	2	-	-	-
C. fragilis	-	21	+	156	326	118	111	29	71	20	25	15
C. furcellatus	177	81	133	104	122	169	66	75	28	31	9	-
C. septentrionalis	-	-	-	5	11	6	-	-	4	-	1	-
C. socialis	59	18	109	84	60	51	10	5	15	6	+	5
C. wighami	66	16	19	33	34	18	+	+	18	+	7	-
C. spp.	39	19	53	+	+	23	45	22	25	12	6	7
Coscinodiscus	+	-	-	28	42	+	+	+	+	+	+	+
C. kuetzingii	-	-	-	-	-	-	-	-	-	-	-	+
C. polyacanthus	-	-	-	-	-	-	+	-	-	-	-	-
C. spp.	+	-	-	28	42	+	+	+	+	+	+	-
Detonula	7	9	11	11	+	14	12	2	2	-	4	-
D. confervacea	7	9	11	11	+	14	12	2	2	-	4	-
Eucampia	-	-	3	-	6	-	2	-	-	-	-	-
E. groenlandica	-	-	3	-	-	-	-	-	-	-	-	-
E. zodiacus	-	-	-	-	6	-	2	-	-	-	-	-
Leptocylindrus	-	-	-	-	-	-	-	3	-	-	-	-
L. danicus	-	-	-	-	-	-	-	3	-	-	-	-
Porosira	4	+	+	1	-	-	-	-	-	-	-	-
P. glacialis	4	+	+	1	-	-	-	-	-	-	-	-

Table II-4. (cont'd.)

Depth (m)	0	1	3	5	7	10	20	30	40	50	100	130
Thalassiosira	66	13	39	9	32	11	69	40	65	14	53	9
T. condensata	-	-	-	-	-	-	-	5	-	-	-	-
T. decipiens	1	-	-	-	-	-	-	8	-	-	-	-
T. gravida	29	+	11	+	16	+	25	2	16	10	15	7
T. nordenskioldii	36	13	28	8	16	+	44	+	49	4	35	2
T. spp.	-	-	-	1	+	11	+	25	+	+	3	-
Unidentified	4	3	3	7	16	1	6	+	3	11	11	1
Pennales	122	32	16	64	75	42	104	135	61	114	39	48
Cocconeis	2	-	-	-	-	-	+	-	-	1	-	-
C. costata	2	-	-	-	-	-	+	-	-	1	-	-
Diploneis	-	-	-	-	-	-	-	-	-	-	+	-
D. smithii	-	-	-	-	-	-	-	-	-	-	+	-
Fragilariopsis	27	26	6	10	11	14	30	12	7	+	5	38
**F. oceanica*	27	26	6	10	11	14	30	12	7	+	5	38
Navicula	18	3	2	41	43	10	35	46	13	34	12	8
N. directa	-	-	-	+	-	-	-	-	-	-	-	-
N. kariana	2	+	+	-	-	-	-	-	+	+	-	-
N. pelagica	16	3	+	39	38	-	35	46	13	34	12	8
N. transitans	+	-	-	-	-	-	-	-	-	-	-	-
N. vanhoeffenii	-	-	-	2	-	-	+	-	-	-	-	-
N. spp.	-	-	2	+	5	-	1	1	-	-	-	-
Nitzschia	75	3	8	8	15	15	39	77	33	48	11	-
N. brebissonii	-	-	-	-	+	-	-	-	-	-	-	-
N. cylindrus	73	1	2	7	9	9	39	68	28	45	6	-
N. longissima	-	-	-	-	1	-	-	-	1	-	-	-
N. polaris	-	-	-	1	-	-	-	-	-	-	-	-
N. seriata	2	2	6	-	5	6	-	9	4	3	5	-
Unidentified	-	-	-	5	6	3	-	-	8	32	11	2

*Now *Nitzschia grunowii*

Table II-4. (cont'd.)

Depth (m)	0	1	3	5	7	10	20	30	40	50	100	130
Chlorophyta	-	-	2	-	1	4	-	1	2	-	-	1
Carteria	-	-	-	-	-	4	-	1	-	-	-	-
C. sp.	-	-	-	-	-	4	-	1	-	-	-	-
Pyramimonas	-	-	2	-	1	-	-	-	2	-	-	1
P. grossii	-	-	2	-	1	-	-	-	2	-	-	1
Cryptophyta	-	-	-	-	-	1	-	-	-	-	-	-
Chroomonas	-	-	-	-	-	1	-	-	-	-	-	-
C. sp.	-	-	-	-	-	1	-	-	-	-	-	-
Cyanophyta	-	-	-	-	-	-	-	20	-	-	-	5
Nostoc	-	-	-	-	-	-	-	20	-	-	-	5
N. sp.	-	-	-	-	-	-	-	20	-	-	-	5
Euglenophyta	1	-	-	-	-	-	-	-	-	-	-	-
Euglena	1	-	-	-	-	-	-	-	-	-	-	-
E. sp.	1	-	-	-	-	-	-	-	-	-	-	-
Pyrrophyta	1	2	-	1	5	2	-	1	3	1	2	-
Gymnodinium	1	1	-	-	4	1	-	1	1	1	2	-
G. sp.	1	1	-	-	4	1	-	1	1	1	2	-
Peridinium	-	-	-	-	1	1	-	-	-	-	-	-
P. sp.	-	-	-	-	1	1	-	-	-	-	-	-
Prorocentrum	-	1	-	1	-	-	-	-	2	-	-	-
P. micans	-	1	-	1	-	-	-	-	2	-	-	-

Table II-5. Quantitative composition and vertical distribution of phytoplankton in east Baffin Island waters at Station E, 11 August 1979.

Depth (m)	0	1	3	5	7	10	20	30	40	50	100	200	230
Temperature (°C)	0.40	0.12	-0.26	-0.36	-0.32	-0.30	-0.51	-0.59	-0.62	-0.67	-1.10	-1.20	-1.20
Salinity (°/₀₀)	32.99	32.98	32.98	33.03	33.06	33.07	33.11	33.12	33.13	33.14	33.18	33.38	33.38
Total phytoplankton ($X10^3$ cells/litre)	26	34	245	206	351	192	172	163	181	110	78	12	5
Bacillariophyta	14	22	241	206	348	188	163	162	181	108	78	10	4
Centrales	14	22	216	102	248	150	148	143	166	75	68	8	2
Bacterosira	-	-	-	-	-	-	-	2	-	-	-	-	-
B. fragilis	-	-	-	-	-	-	-	2	-	-	-	-	-
Chaetoceros	14	15	80	68	115	75	84	108	132	58	41	5	1
C. decipiens	-	3	3	4	20	+	13	-	-	-	-	-	-
C. fragilis	1	+	24	16	60	27	22	26	29	15	17	3	+
C. furcellatus	2	9	32	35	25	22	24	65	66	22	15	2	1
C. socialis	6	3	+	+	+	11	10	8	5	4	-	-	-
C. wighami	-	-	9	+	10	+	+	+	19	12	7	-	-
C. spp.	5	-	12	13	+	15	15	12	13	5	2	+	+
Coscinodiscus	-	7	+	+	17	+	+	+	1	-	-	-	-
C. kuetzingii	-	-	+	+	1	-	-	-	1	-	-	-	-
C. polyacanthus	-	-	-	-	-	+	+	+	-	-	-	-	-
C. spp.	-	7	+	+	16	+	+	-	-	-	-	-	-
Detonula	-	-	-	-	-	-	-	3	-	-	-	-	-
D. confervacea	-	-	-	-	-	-	-	3	-	-	-	-	-
Eucampia	-	-	-	-	-	2	+	+	4	-	-	-	-
E. zodiacus	-	-	-	-	-	2	+	+	4	-	-	-	-
Porosira	-	+	+	23	+	-	-	-	-	-	-	-	-
P. glacialis	-	+	+	23	+	-	-	-	-	-	-	-	-
Thalassiosira	+	+	131	10	112	72	64	25	29	17	24	2	+
T. decipiens	-	-	-	+	6	+	+	4	-	-	-	-	-
T. gravida	+	+	18	+	24	12	11	6	9	4	11	+	+

Table II-5. (cont'd.)

Depth (m)	0	1	3	5	7	10	20	30	40	50	100	200	230
T. nordenskioldii	+	+	113	6	82	60	53	15	18	9	7	2	+
T. spp.	-	-	+	4	+	+	+	+	2	4	6	-	-
Unidentified	-	-	5	1	4	1	+	5	+	+	3	1	-
Pennales	+	+	25	104	100	38	15	19	15	33	10	1	2
Amphiprora	-	-	-	-	+	-	-	-	-	-	-	-	-
A. gigantea var. *septentrionalis*	-	-	-	-	+	-	-	-	-	-	-	-	-
Cocconeis	-	-	-	-	-	-	-	-	+	-	-	-	-
C. costata	-	-	-	-	-	-	-	-	+	-	-	-	-
Fragilariopsis	-	-	1	60	96	10	+	+	+	19	+	+	+
**F. oceanica*	-	-	1	60	96	10	+	+	+	19	+	+	+
Navicula	+	+	22	+	+	11	6	2	5	2	6	1	1
N. kariana	+	-	-	-	+	+	+	+	-	-	-	-	-
N. pelagica	-	-	22	+	+	11	6	2	5	2	6	1	1
N. pygmaea	+	-	-	-	-	-	-	-	-	-	-	-	-
N. spp.	-	+	+	-	-	-	-	-	-	-	-	-	-
Nitzschia	-	-	+	41	+	15	8	15	4	12	3	+	1
N. cylindrus	-	-	+	41	+	12	8	10	4	12	+	+	1
N. seriata	-	-	-	-	-	3	+	5	+	+	3	+	-
Unidentified	+	+	2	3	4	2	1	2	6	+	1	+	+
Chlorophyta	9	10	2	+	1	2	5	+	+	1	-	-	-
Pyramimonas	9	10	2	+	1	2	5	+	+	1	-	-	-
P. grossii	9	10	2	+	1	2	5	+	+	1	-	-	-
Cryptophyta	-	1	-	-	-	-	1	-	-	-	-	-	-
Chroomonas	-	1	-	-	-	-	1	-	-	-	-	-	-
C. sp.	-	1	-	-	-	-	1	-	-	-	-	-	-

*Now *Nitzschia grunowii*

Table II-5. (cont'd.)

Depth (m)	0	1	3	5	7	10	20	30	40	50	100	200	230
Euglenophyta	-	-	1	-	-	-	-	-	-	-	-	-	-
Euglena	-	-	1	-	-	-	-	-	-	-	-	-	-
E. viridis	-	-	1	-	-	-	-	-	-	-	-	-	-
Pyrrophyta	3	1	1	-	2	2	3	1	-	1	-	2	1
Gymnodinium	-	-	1	-	2	1	1	-	-	1	-	1	1
G. gracile	-	-	-	-	-	1	1	-	-	1	-	-	-
G. sp.	-	-	1	-	2	-	-	-	-	-	-	1	1
Peridinium	3	1	-	-	-	-	1	-	-	-	-	1	-
P. sp.	3	1	-	-	-	-	1	-	-	-	-	1	-
Prorocentrum	-	-	-	-	1	1	1	1	-	-	-	-	-
P. micans	-	-	-	-	1	1	1	1	-	-	-	-	-

Table II-6. Quantitative composition and vertical distribution of phytoplankton in east Baffin Island waters at Station F-e, 21 July 1979.

Depth (m)	0	1	3	5	7	10	20	30
Temperature (°C)	2.3	2.2	1.4	1.2	0.7	-0.8	-1.2	-1.0
Salinity (°/₀₀)	29.5	30.0	30.5	30.5	31.5	33.0	33.0	33.0
Total phytoplankton ($X10^3$ cells/litre)	1176	1354	714	1114	1128	1435	94	72
Bacillariophyta	1176	1353	714	1111	1127	1430	83	67
Centrales	323	325	152	319	277	395	21	20
Bacterosira	-	-	-	-	-	4	-	-
B. fragilis	-	-	-	-	-	4	-	-
Chaetoceros	-	-	-	1	1	6	-	-
C. furcellatus	-	-	-	23	16	6	-	-
C. septentrionalis	-	-	-	-	1	-	-	-
C. wighami	-	-	-	7	-	-	-	-
C. spp.	-	-	-	11	-	-	-	-
Coscinodiscus	-	-	-	-	-	+	+	-
C. lacustris var. *septentrionalis*	-	-	-	-	-	+	+	-
Detonula	30	60	51	38	32	27	10	-
D. confervacea	30	60	51	38	32	27	10	-
Eucampia	-	-	-	-	3	-	-	-
E. zodiacus	-	-	-	-	3	-	-	-
Lauderia	33	-	-	12	-	-	-	-
L. borealis	33	-	-	12	-	-	-	-
Porosira	16	-	-	+	-	-	-	-
P. glacialis	16	-	-	+	-	-	-	-
Thalassiosira	223	233	93	164	215	287	10	14
T. condensata	5	-	15	12	4	22	-	-
T. decipiens	83	75	27	64	96	103	3	7
T. gravida	23	12	4	23	16	59	3	5
T. nordenskioldii	52	51	20	43	44	40	4	2
T. spp.	60	95	27	22	55	63	-	-
Unidentified	21	32	8	64	10	71	1	6

Table II-6. (cont'd.)

Depth (m)	0	1	3	5	7	10	20	30
Pennales	853	1028	562	792	850	1035	62	47
Achnanthes	-	-	-	43	80	32	-	-
A. taeniata	-	-	-	43	80	32	-	-
Cocconeis	-	-	-	-	1	-	-	1
C. scutellum	-	-	-	-	1	-	-	1
Fragilariopsis	94	244	59	200	208	384	42	30
**F. oceanica*	94	244	59	200	208	384	42	30
Grammatophora	-	-	-	-	-	-	-	1
G. serpentina	-	-	-	-	-	-	-	1
Licmophora	-	1	-	-	-	1	-	-
L. gracilis	-	1	-	-	-	1	-	-
Navicula	405	480	384	372	374	412	-	3
N. kariana	-	-	-	+	-	+	-	-
N. pelagica	141	148	140	292	372	411	9	3
N. quadripedis	261	331	244	71	-	-	-	-
N. transitans	+	-	-	-	-	-	-	-
N. vanhoeffenii	-	-	-	8	-	-	-	-
N. spp.	3	1	-	1	2	1	-	-
Nitzschia	291	261	115	115	128	182	-	4
N. cylindrus	290	260	100	104	114	162	10	4
N. frigida	-	-	-	-	4	-	-	-
N. seriata	1	1	15	11	10	20	-	-
N. spp.	-	-	+	-	-	-	-	-
Pinnularia	-	-	+	+	-	-	-	-
P. quadratarea	-	-	+	+	-	-	-	-
Unidentified	63	43	4	62	60	24	1	8
Chlorophyta	-	-	-	-	-	3	1	1
Carteria	-	-	-	-	-	2	1	-
C. sp.	-	-	-	-	-	2	1	-

*Now *Nitzschia grunowii*

Table II-6. (cont'd.)

Depth (m)	0	1	3	5	7	10	20	30
Kirchneriella	-	-	-	-	-	-	-	1
K. lunaris	-	-	-	-	-	-	-	1
Tetraselmis	-	-	-	-	-	1	-	-
T. suecica	-	-	-	-	-	1	-	-
Chrysophyta	-	-	-	-	-	-	5	2
Phaeocystis	-	-	-	-	-	-	5	2
P. pouchetii	-	-	-	-	-	-	5	2
Crytophyta	-	-	-	1	1	1	1	1
Chroomonas	-	-	-	1	-	1	-	1
C. sp.	-	-	-	1	-	1	-	1
Cryptomonas	-	-	-	-	1	-	-	-
C. sp.	-	-	-	-	1	-	1	-
Euglenophyta	-	1	-	-	-	-	1	1
Euglena	-	1	-	-	-	-	-	-
E. sp.	-	1	-	-	-	-	-	-
Trachelomonas	-	-	-	-	-	-	1	-
T. sp.	-	-	-	-	-	-	1	-
Unidentified	-	-	-	-	-	-	-	1
Pyrrophyta	-	-	-	2	-	1	3	-
Gymnodinium	-	-	-	-	-	1	-	-
G. sp.	-	-	-	-	-	1	-	-
Minuscula	-	-	-	2	-	-	-	-
M. bipes	-	-	-	2	-	-	-	-
Peridinium	-	-	-	-	-	-	3	-
P. sp.	-	-	-	-	-	-	3	-

Appendix III

Table III-1. Zooplankton, stations A, 8 Aug., B, 6 Aug., C, 12 Aug. and D, 7 Aug. 1979. Vertical hauls with 30-cm diameter, 0.073-mm mesh nets. Numbers show individuals per 1 m^3.

		St. A	St. B	St. C	St. D
Collection no.		P-22	P-2	P-43	P-5
Time (hours)		1208	1530	1052	1515
Depth (metres)		30-0	10-0	70-0	140-0
gastropod larvae		3.8			0.8
polychaete larvae		50	80	62	20
Conchoecia elegans					0.2
Philomedes globosus			1.4		
Calanus finmarchicus	F			0.8	0.7
	V				0.5
Calanus glacialis	F			0.4	2.1
	V	3.3		2.7	10
	IV	0.5		0.2	0.3
	III	1.4	1.4	1.2	0.2
	II	2.4	5.7	1.8	0.8
	I	19	2.9	13	4.8
Calanus hyperboreus	F			0.4	1.2
	V	0.5			2.1
	IV			0.2	0.2
	III	3.3	1.4	1.4	1.8
	II	2.9	2.9	0.4	0.8
	I	3.8			
Heterorhabdus norvegicus	M				0.1
Metridia longa	M	1.0			2.2
	F			0.2	3.5
	V	1.0		0.4	10
	II				0.8
Microcalanus pygmaeus	F	3.8			4.0
	V			1.6	0.8
	IV			1.6	0.8
Pseudocalanus sp.	M	2.9			3.2
	F	29	1.4	1.4	11
	V			1.6	0.8
	IV	11		6.6	3.4
	III	38		23	9.6
	II	99	11	21	23
	I	122		34	33
copepod nauplii		1021	2994	779	419
copepod eggs		693	286	779	207
Oithona similis		42			
Oncaea borealis		50			
cyclopoids			766	224	131

Table III-1. Continued.

	St. A	St. B	St. C	St. D
Collection no.	P-22	P-2	P-43	P-5
Time (hours)	1208	1530	1052	1515
Depth (metres)	30-0	10-0	70-0	140-0
Parathalestris jacksoni		1.4		
Ectinosoma sp.	7.6			
Microsetella norvegica	7.6			
Tisbe furcata	3.8			
harpacticoids		57	18	16
cirripede nauplii	3.8	11	1.6	3.2
isopods	3.8			0.8
euphausiid larvae			0.2	1.6
echinoderm larvae	11	114	73	55
Oikopleura vanhoeffeni	4.8	4.3	3.9	3.2

Table III-2. Zooplankton, station A, 13 Aug. 1979. Vertical hauls with 30-cm, 0.073-mm mesh nets. Numbers show individuals per 1 m^3.

Collection no.		P-49	P-51	P-53	P-59	P-61	P-63
Time (hours)		0043	0049	0055	1110	1116	1121
Depth (metres)		30-0	20-0	10-0	30-0	20-0	10-0
gastropod larvae		3.8				5.7	
polychaete larvae		7.6	29	183	57	74	23
Calanus glacialis	F	1.4	2.1		1.0		
	V	5.7	11	4.3	5.7	3.6	2.9
	IV	1.4	0.7				
	III	1.0	2.1	1.4	1.9	3.6	
	II	3.8	7.1	13	4.8	5.7	10
	I	7.6	17	57	21	26	27
Calanus hyperboreus	F	0.5				1.4	
	V	1.4		1.4		0.7	
	IV	0.5	1.4	1.4	0.5	0.7	
	III	4.8	5	2.9	3.3	6.4	1.4
	II	1.0			0.5	0.7	
	I					0.7	
Metridia longa	M	1.4	2.1	1.4	1.0		
	F	0.5		7.1			
	V	1.0	4.3	5.8			
Microcalanus pygmaeus	V				3.8		
Pseudocalanus sp.	M	0.5	5.7	2.9		0.7	1.4
	F	11	9.3	2.9	7.6	17	24
	V		5.7		7.6	5.7	
	IV		5.7		19	11	22
	III	23	69		23	29	11
	II	46	60	46	30	17	
	I	42	69	46	69	40	23
copepod nauplii		1013	1726	3737	1794	1651	2800
copepod eggs		499	491	743	396	697	1063
Oithona similis		99	102	332	198	*	*
Oncaea borealis		7.6	80	137	31	*	*
Oncaea minuta		68	57		83	*	*
Cyclopina schneideri		3.8				*	*
cyclopoids						434	651
Ectinosoma sp.				11		*	*
Harpacticus superflexus		7.6				*	*
Microsetella norvegica		19	5.7	11		*	*
Tisbe furcata			0.7	11		*	*
harpacticoids			5.7			5.7	23
cirripede nauplii			0.7	11	0.5		
Dajus mysidis		4.3					
epicarid isopod			0.7				
euphausiid larvae		3.8	5.7		3.8	5.7	11
echinoderm larvae		57	86	149	76	120	217
Oikopleura vanhoeffeni		3.3	4.3	5.7	5.2	7.1	1.4

*these combined as cyclopoids or harpacticoids

Table III-3. Zooplankton, station E, 11 Aug. 1979. Vertical hauls with 30-cm, 0.073-mm mesh nets. Numbers show individuals per 1 m^3.

Collection no.		P-31	P-33	P-35	P-37
Time (hours)		1052	1110	1123	1132
Depth (metres)		200-0	100-0	50-0	30-0
gastropod larvae		1.1			
polychaete larvae		7.4			
Calanus finmarchicus	F	0.3			
	V	0.4			
Calanus glacialis	F	1.1	0.6		
	V	8.1	1.7		
	IV	0.4			
	III	0.7		2.3	
	II	1.3	3.4	5.7	
	I	2.9	14	29	15
Calanus hyperboreus	F	0.7			
	V	1.9			
	IV	0.6	0.6		
	III	1.6	3.4	1.1	1.9
	II	0.3			
Chiridius obtusifrons	III	+			
Euchaeta glacialis	F	+			
	V	+			
	IV	+			
	III	0.1			
Heterorhabdus norvegicus	M	+			
Metridia longa	M	2.0			
	F	5.5	0.6		
	V	5.0	0.6		
Microcalanus pygmaeus	M	0.1			
	F	0.5	1.1		
	V	3.4	0.6		
	IV	2.3			
	I	0.6			
Pseudocalanus sp.	M	0.3			
	F	4.3	2.3		
	V	2.2	1.7	1.1	
	IV	11	6.9		
	III	6.2	15	3.4	
	II	26	27	19	3.8
	I	22	25	24	21
copepod nauplii		373			
copepod eggs		272			

Table III-3. Continued.

Collection no.	P-31	P-33	P-35	P-37
Time (hours)	1052	1110	1123	1132
Depth (metres)	200-0	100-0	50-0	30-0
cyclopoids	130			
harpacticoids	7.4			
cirripede nauplii	2.3			
euphausiid larvae	1.7			
echinoderm larvae	46			
Oikopleura vanhoeffeni	2.4	14		9.5

Table III-4. Zooplankton, station F, 20-21 July 1979. Vertical and horizontal hauls with 30-cm diameter, 0.073-mm mesh nets. Numbers show individuals per 1 m^3.

		St. F-c			St. F-d	
Collection no.	P-501	P-505	P-507	P-511	P-521	P-523
Time (hours)	1105	1130	1145	1326	0040	0056
Depth (metres)	35-0	20-0	10-0	0	0	5
polychaete larvae	9.6	46	34		1.5	4.5
Philomedes globosus					2.3	0.4
Acartia longiremis M					1.0	
V					0.5	
Calanus glacialis F	3.2				1.5	1.5
V	6.4	17			1.0	3.0
IV	3.2	5.7			5.5	7.0
III					0.5	0.5
II						0.5
I		5.7				
Calanus hyperboreus F		5.7				
V	6.4	11	11		2.0	1.0
III	6.4					
II						0.5
Metridia longa M	9.6					
F	38				0.5	8.5
V	77	23			0.5	6.5
IV	9.6					0.5
Microcalanus pygmaeus F	9.6					
Pseudocalanus sp. M	77	171				19
F	381	337	11		0.5	73
V	80	69	11		1.0	8
IV	9.6	11				
I						1.5
copepod nauplii	1014	2503	2217	17	665	218
Oithona similis		23	11	0.5	1.5	2.0
Oncaea borealis		52	11		2.5	14
harpacticoids				5	1.5	1.0
Monstrilla sp.				0.5	1.0	
cirripede nauplii	13				0.8	1.5
epicarid isopods	3.2					1.5

Table III-5. Zooplankton, station F-d, 16 Sept. 1979. Vertical and horizontal hauls with 30-cm, 0.073-mm mesh nets. Numbers show individuals per 1 m^3.

Collection no.		007	009	011	013	015
Time (hours)		1820	1830	1837	2218	2236
Depth (metres)		35-0	20-0	10-0	5	0
pelecypod larvae				11	14	
polychaete larvae		13	5.7	11	7.1	2.0
Philomedes globosus					+	1.0
Calanus finmarchicus	M				+	
	F	0.8			+	
Calanus glacialis	F			1.4	0.3	
	V	4.0		1.4	0.4	1.0
	IV	0.8	2.9	11	4.2	1.0
	III	2.4	5.7	10	17	6.0
	II	1.6	8.6	26	24	11
	I	9.6	8.6	69	27	19
Calanus hyperboreus	F	0.8			0.1	1.0
	V	1.2			0.2	
	IV	5.2	17	1.4	1.9	6.0
	III	1.6	2.9			
	I		5.7			
Metridia longa	M	1.2			+	5.0
	F	1.2			0.4	20
	V	2.4			0.3	14
	II				1.8	
Pseudocalanus	M	0.8			0.4	
	F	20	34	19	24	16
	V	61	57	23	37	9.0
	IV	51	85	34	47	9.0
	III	61	149	354	96	40
	II	163	286	629	267	61
	I	502	920	2137	613	344
copepod nauplii		1187	2694	6629	1595	2520
copepod eggs		243	543	697	642	190
cyclopoids		115	160	183	30	43
harpacticoids		6.4	2.9	60	3.6	3.0
cirripede nauplii		0.4			0.4	
euphausiid larvae				11	0.1	0.2
echinoderm larvae		22	17	60	14	
Oikopleura vanhoeffeni		62	196	139	11	3.2

Table III-6. Zooplankton, station A, 8 Aug. 1979, and station B, 6 Aug. 1979. Horizontal hauls with 1-m diameter, 1-mm mesh nets. Numbers show individuals per 10 m^3.

	Station A			Station B
Collection no.	P-27	P-28	P-29	P-3
Time (hours)	1738	1815	1715	1730
Depth (metres)	5	15	25	10-0
Aeginopsis laurenti		0.1	+	0.2
Aglantha digitale	0.3	0.6	+	0.7
Sarsia princeps	+			
Dimophyes arctica		+	+	
Scyphozoa ephyra		+		
Mertensia ovum	+	+		
Clione limacina	+	+	+	
Spiratella helicina		+	+	7.0
Autolytus prismaticus		+	+	+
A. prolifer				+
Syllis cornuta				+
Mysis oculata	+		3.5	
Mysis sp.			+	
Dajus mysidis			+	
Apherusa glacialis				+
Halirages megalops			+	
Onisimus glacialis	+			
Hyperia galba		+	+	
Parathemisto abyssorum		+	+	
P. libellula	0.3	0.1	+	3.2
Thysanoessa inermis		+		
Sabinea septemcarinata		+	+	
Spirontocaris phippsi		0.4	0.5	
Pagurus pubescens		+	+	
Eukrohnia hamata	+	0.7	0.7	+
Sagitta elegans	+	0.5	0.7	

Table III-7. Zooplankton, station A, 13 Aug. 1979. Horizontal hauls with 1-m diameter, 1-mm mesh nets. Numbers show individuals per 10 m^3.

Collection no.	P-66	P-65	P-64	P-54	P-55	P-56
Time (hours)	1331	1302	1232	0143	0123	0103
Depth (metres)	2-3	13-16	25-30	1-4	15	25
Aeginopsis laurenti		0.2				0.2
Aglantha digitale	+	1.9	3.3		0.8	2.2
Sarsia princeps	+					
Dimophyes arctica		0.1				+
Beroe cucumis	+	+				
Mertensia ovum		+	+			+
Clione limacina		+	+		+	+
Spiratella helicina	0.3	0.8	0.3		0.4	0.3
Nereis pelagica				+		
Mysis mixta				0.8	+	0.6
M. oculata			3.8	54	9.1	17
Dajus sp.			0.1	4.9	1.1	1.1
Onisimus glacialis		+				
Westwoodilla brevicalar						0.2
Hyperia galba		+	+		+	
Parathemisto abyssorum		+	0.2		0.2	0.2
P. libellula	+	0.9	1.3	+	0.6	0.3
Sabinea septemcarinata		+			0.2	+
Spirontocaris phippsi		+	0.2		0.7	0.6
Eukrohnia hamata	+	0.4	0.8		1.0	0.5
Sagitta elegans		0.1	0.3		0.4	0.7

Table III-8. Zooplankton, station D, 7 Aug. 1979. Horizontal hauls with 1-m diameter, 1-mm mesh nets. Numbers show individuals per 10 m^3.

Collection no.	P-16	P-17	P-18	P-19	P-20
Time (hours)	1827	1625	1758	1655	1730
Depth (metres)	5	15	25	40-50	115
Aeginopsis laurenti			+	0.2	+
Aglantha digitale	2.2	1.4	2.2	1.0	0.8
Sarsia princeps			+	+	
Dimophyes arctica			+	+	+
Beroe cucumis			+		
Mertensia ovum	+			+	+
Clione limacina	+	+		+	
Spiratella helicina	0.2	0.2	0.2	0.1	0.1
Sphaerosyllis erinaceus				+	
Tomopterid					+
Onisimus glacialis			+		
Hyperia galba		+	+	+	
Parathemisto abyssorum	+		0.2	0.7	0.8
P. libellula	0.9	2.1	0.1	0.2	0.1
Thysanoessa inermis			+	+	
T. raschii					+
Sabinea septemcarinata			+	+	0.2
Spirontocaris phippsi				+	+
Eukrohnia hamata			0.1	0.6	1.0
Sagitta elegans			0.1	0.1	0.3

Table III-9. Zooplankton, station E, 11 Aug. 1979. Horizontal hauls with 1-m diameter, 1-mm mesh nets. Numbers show individuals per 10 m^3.

Collection no.	P-41	P-40	P-39	P-38
Time (hours)	1446	1418	1344	1248
Depth (metres)	20	40	75	130-150
Aeginopsis laurenti	+			+
Aglantha digitale	0.5	1.5	0.7	1.4
Sarsia princeps			+	
Dimophyes arctica				0.2
Mertensia ovum		+	+	
Clione limacina	+	+	+	+
Spiratella helicina	1.5	0.4	+	0.2
Autolytus prismaticus	+			
Hyperia galba	+	+		
Parathemisto abyssorum		+	0.8	0.4
P. libellula	1.6	0.7	0.5	0.3
Thysanoessa raschii				+
Sabinea septemcarinata		+	+	+
Eukrohnia hamata	0.2		0.2	1.4
Sagitta elegans		+	0.2	0.3
S. maxima				+

Table III-10. Zooplankton, station F, 20-21 July 1979. Horizontal hauls with 1-m diameter, 1-mm mesh nets. Numbers show individuals per 10 m^3.

	St. F-c				St. F-d	
Collection no.	P-517	P-516	P-515	P-514	P-518	P-519
Time (hours)	1648	1634	1615	1555	2355	0013
Depth (metres)	0	5	15	25	0	5
Aeginopsis laurenti		+		0.1		
Aglantha digitale			0.8	0.3	+	+
Bougainvillia superciliaris			+			
Euphysa flammea			0.1		+	0.3
Scyphozoa ephyra					+	
Mertensia ovum			+			
Clione limacina			+	+	+	
Spiratella helicina			+		+	
Autolytus cornutus						
A. prismaticus						+
A. prolifer					+	
Scalibregma inflatum						+
Mysis mixta					1.0	6.5
M. oculata			0.8	1.6	3.3	24
Dajus sp.			+	0.1	0.1	
Anonyx nugax						+
Halirages megalops				+		
Ischyrocerus anguipes				+		
Onisimus glacialis						0.2
Parapleustes bicuspis				+		
Hyperia galba		+		+		
Parathemisto libellula	+	0.8	0.5	0.2	0.2	4.0
Thysanoessa inermis						+
T. raschii					+	+
Eualus gaimardi				+		
Sabinea septemcarinata					0.1	
Spirontocaris phippsi				+	+	6.6
Eukrohnia hamata		0.3	1.6	0.7	0.3	0.3
Sagitta elegans		+	0.7	1.3	0.2	0.8

Table III-11. Zooplankton, station F-d, 17 Sept. 1979. Horizontal hauls with 1-m diameter, 1-mm mesh nets. Numbers show individuals per 10 m^3.

Collection no.	P-025	P-024	P-023	P-022	P-018	P-017
Time (hours)	1248	1232	1215	1157	2310	2257
Depth (metres)	0	5	15	25	0	5
Aeginopsis laurenti				1.1	0.3	
Aglantha digitale	0.3		1.0	1.1		1.7
Euphysa flammea						0.6
Sarsia tubulosa				0.3		
Mertensia ovum				0.3		
Autolytus sp.						0.6
Mysis mixta						6.1
M. oculata				0.3	2.2	144
Dajus sp.						1.1
Thysanoessa inermis						0.6
T. raschii						0.6
Sabinea septemcarinata				0.3		3.3
Spirontocaris phippsi						2.8
Eukrohnia hamata		0.6	2.0	0.5	21	0.6
Sagitta elegans	0.3			1.1		

Table III-12. Pelagic food of larval fishes.

Species	*T. pingeli*									*Icelus* sp.		
Station	A	A	A	A	A	A	A	A	F-d	F-d	F-d	F-d
Length (mm)	37.4	34.9	34.5	34.2	34.1	32.0	29.4	26.7	25.2	27.0	25.8	25.2
Mysis sp.	1						1					
Oikopleura vanhoeffeni												
Spiratella helicina	1											
Lamprops sp.		1										
Parapleustes bicuspis												
Calanus hyperboreus F				1								
V					1							
III												
Calanus glacialis IV												
Metridia longa F	1	1					1					
M	1					1						
Harpacticus superflexus												
H. uniremis			1									
Metridia longa V	2			1	1							
Tisbe furcata	1											
Monstrilla dubia												
Pseudocalanus sp. F			4			4	9	18	15			2
V									2	2	1	
M	1		1				3		2			
Calanus glacialis I												
Pseudocalanus sp. III												
II												
I												
Microcalanus pygmaeus												
Oithona similis												
Oncaea borealis												
copepodites, fragmentary					4				+		2	1
cirripede nauplii												
copepod nauplii							1			1		
copepod eggs			+	+					+			+

Table III-12. Continued.

Species		*L. fabricii*						*G. tricuspis*							
Station		A	E	F-d	F-d	F-d	F-d	D	E	E	E	A	A	A	E
Length (mm)		27.5	24.8	22.1	22.1	21.7	18.4	21.0	19.8	19.5	19.3	19.3	18.6	18.1	16.2
Mysis sp.															
Oikopleura vanhoeffeni			2												
Spiratella helicina															
Lamprops sp.															
Parapleustes bicuspis								1							
Calanus hyperboreus	F						2								
	V														
	III	1													
Calanus glacialis	IV											1			
Metridia longa	F														
	M						1								
Harpacticus superflexus															
H. uniremis															
Metridia longa	V				1										
Tisbe furcata															
Monstrilla dubia															
Pseudocalanus sp.	F			5					1		1			1	1
	V														
	M			6		1	3								
Calanus glacialis	I														
Pseudocalanus sp.	III							1					1		
	II								1						
	I													1	
Microcalanus pygmaeus													4		
Oithona similis															
Oncaea borealis				1											
copepodites, fragmentary					+			+		+		+	1		
cirripede nauplii															
copepod nauplii											4				4
copepod eggs										+					

Table III-12. Continued.

Species	*M. scorpius*					*L. maculatus*		*L. decagonus*					
Station	A	A	F-d	F-d	F-d	A	A	A	A	A	A	A	A
Length (mm)	20.7	17.6	14.6	14.5	14.5	17.9	17.7	19.1	18.6	18.6	17.5	15.7	15.0
Mysis sp.													
Oikopleura vanhoeffeni													
Spiratella helicina													
Lamprops sp.													
Parapleustes bicuspis													
Calanus hyperboreus F													
V													
III													
Calanus glacialis IV		1											
Metridia longa F													
M	1												
Harpacticus superflexus				1									
H. uniremis			2										
Metridia longa V	1	8											
Tisbe furcata													
Monstrilla dubia			1										
Pseudocalanus sp. F		1		6									
V													
M													
Calanus glacialis I													
Pseudocalanus sp. III													
II													
I													
Microcalanus pygmaeus													
Oithona similis		1											
Oncaea borealis													
copepodites, fragmentary			3				1						
cirripede nauplii		1											
copepod nauplii	1	1						6	3	4			1
copepod eggs	+		75	82				6		1	1		5

Table III-12. Continued.

Species	*A. olriki*				*Icelus ?*			*S. punctatus*		
Station	D	A	E	A	F-d	F-d	F-d	A	A	F-d
Length (mm)	16.9	16.5	16.3	15.8	16.2	15.9	15.4	13.8	13.6	11.2
Mysis sp.										
Oikopleura vanhoeffeni										
Spiratella helicina										
Lamprops sp.										
Parapleustes bicuspis										
Calanus hyperboreus F										
V										
III										
Calanus glacialis IV										
Metridia longa F										
M										
Harpacticus superflexus										
H. uniremis										
Metridia longa V										
Tisbe furcata										
Monstrilla dubia										
Pseudocalanus sp. F					5	3	1			
V										
M										
Calanus glacialis I										
Pseudocalanus sp. III										
II										
I										
Microcalanus pygmaeus										
Oithona similis										
Oncaea borealis										
copedodites, fragmentary										
cirripede nauplii										
copepod nauplii		2								
copepod eggs	+		8	3	84	15	92			

Table IV-1. Numbers of individuals of each species comprising the different taxonomic groups collected by each oblique tow in Frobisher Bay and at Brevoort Island.

		TC1			TC3		TC4			TC5			TC9		
Taxonomic group	Species	A	B	C	A	B	A	B	C	A	B	C	A	B	C
Amphipoda (Hyperiid)	*Parathemisto libellula*	12	7	11	3	6	1	5	1	20	10	22	2	6	3
	Parathemisto abyssorum	0	0	0	1	0	27	27	30	2	0	1	0	0	0
	Hyperia galba	0	0	0	0	0	1	2	1	1	2	0	0	0	0
Amphipoda (Gammarid)	*Onisimus glacialis*	0	0	0	0	0	0	3	0	1	0	0	0	0	1
Chaetognatha	*Sagitta elegans*	6	5	4	4	13	2	5	6	2	1	1	14	16	26
	Eukrohnia hamata	0	0	0	8	11	42	42	45	9	3	7	0	0	0
Coelenterata	*Aeginopsis laurenti*	0	0	0	0	1	1	3	2	3	0	0	0	0	0
	Aglantha digitale	0	0	0	9	8	38	58	32	47	38	27	0	0	0
	Dimophyes arctica	0	0	0	0	2	4	1	6	1	0	0	0	0	0
	Sarsia tubulosa	0	0	0	0	0	0	0	0	0	1	0	1	1	1
	Bougainvillia superciliaris	1	2	0	0	0	0	0	0	0	0	0	3	0	0
	Euphysa flammea	0	2	1	0	0	0	0	0	0	0	0	0	0	0
	Hybocodon prolifer	0	0	2	0	0	0	0	0	0	0	0	4	2	0
	Halitholus cirratus	0	0	0	0	0	0	0	0	0	0	0	1	0	2
	Unidentified	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Ctenophora	*Mertensia ovum*	5	11	3	0	0	8	8	8	0	1	1	20	24	18
	Beroe cucumis	0	0	0	0	0	1	0	0	2	0	2	0	0	0
Pteropoda	*Spiratella helicina*	0	0	0	1	1	1	3	1	33	19	21	1	0	0
	Clione limacina	0	0	0	0	0	3	0	0	1	0	1	0	0	0
Decapoda (Larvae)	*Sabinea septemcarinata*	0	0	0	0	2	5	4	3	1	0	1	0	0	0
	Spirontocaris sp.	35	41	24	13	16	1	0	2	1	0	0	6	17	11
Polychaeta	*Autolytus alexandri*	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Autolytus prismaticus	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Mysidacea	*Mysis mixta*	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	Mysis oculata	0	0	0	20	10	0	0	0	0	0	0	0	0	0
Fish	Unidentified larvae	1	0	0	1	5	0	4	3	1	1	1	1	2	0

Table IV-2. Dry weights of the different taxonomic groups collected by oblique tows (3 tows pooled) in Frobisher Bay and at Brevoort Island.

Taxonomic group	Dry weight (mg) TC1	TC3	TC4	TC5	TC9
Amphipoda (Hyperiid)	113.3	8.5	158.3	266.2	95.8
Amphipoda (Gammarid)	0.0	0.0	0.0	0.0	0.0
Chaetognatha	25.7	52.2*	162.3*	31.3*	176.4
Euphausiacea	0.0	0.0	0.0	0.0	5.5
Coelenterata	2.9	993.7	1107.7	996.9	40.1
Ctenophora	961.1	8.8	0.0	482.0	4544.0
Pteropoda	5.6	0.0	163.3	262.8	6.1
Decapoda (Larvae)	55.5	15.6	27.7	16.9	48.9
Polychaeta	0.0	0.0	0.0	0.0	1.2
Mysidacea	0.0	697.2	0.0	0.0	0.0
Fish (Larvae)	3.3	141.0	4.6	7.7	2.1
Total	1167.4	1917.0	1623.9	2063.8	4920.1

*determined from formalin-preserved samples.

Table IV-3. Weight specific caloricity of the different taxonomic groups collected by oblique tows in Frobisher Bay and at Brevoort Island. Values in parentheses are for comparable samples collected at other stations.

	Weight specific caloricity (cal/mg dry weight)								
	TC1			TC3			TC4		
Taxonomic group	N	Cal/mg	S.D.	N	Cal/mg	S.D.	N	Cal/mg	S.D.
Amphipoda (Hyperiid)	5	4.73	0.12	-	(4.14)	-	5	4.44	0.26
Amphipoda (Gammarid)	-	-	-	-	-	-	-	-	-
Chaetognatha	3	5.01	0.33	-	(5.01)	-	-	(5.01)	-
Euphausiacea	-	-	-	-	-	-	-	-	-
Coelenterata	-	(1.92)	-	5	0.43	0.07	5	2.63	0.24
Ctenophora	5	1.71	0.45	-	(1.25)	-	-	-	-
Pteropoda	1	4.23	-	-	-	-	5	3.28	0.13
Decapoda (Larvae)	5	4.73	0.11	-	(4.73)	-	-	(4.73)	-
Polychaeta	-	-	-	-	-	-	-	-	-
Mysidacea	-	-	-	5	3.99	0.13	-	-	-
Fish (Larvae)	-	(1.24)	-	4	1.24	0.28	-	(1.24)	-

Table IV-3. Continued.

Taxonomic group	Weight specific caloricity (cal/mg dry weight) TC5 N	TC5 Cal/mg	TC5 S.D.	TC9 N	TC9 Cal/mg	TC9 S.D.
Amphipoda (Hyperiid)	5	4.14	0.03	5	4.66	0.11
Amphipoda (Gammarid)	-	-	-	-	-	-
Chaetognatha	-	(5.01)	-	5	5.16	0.26
Euphausiacea	-	-	-	1	4.40	-
Coelenterata	5	1.09	0.15	3	1.92	0.53
Ctenophora	5	1.25	0.17	5	1.48	0.14
Pteropoda	6	2.95	0.08	1	4.06	-
Decapoda (Larvae)	-	(4.73)	-	4	4.98	0.15
Polychaeta	-	-	-	-	(5.04)*	-
Mysidacea	-	-	-	-	-	-
Fish (Larvae)	-	(1.24)	-	-	(1.24)	-

*Value from Frobisher Bay polychaete samples obtained in another study.

Table IV-4. Energy content of the different taxonomic groups collected by oblique tows (3 tows pooled) in Frobisher Bay and at Brevoort Island.

Taxonomic group	Energy content (calories)				
	TC1	TC3	TC4	TC5	TC9
Amphipoda (Hyperiid)	535.9	35.3	703.0	1103.1	446.2
Amphipoda (Gammarid)	0.0	0.0	0.0	0.0	0.0
Chaetognatha	128.9	261.4	813.5	156.7	910.4
Euphausiacea	0.0	0.0	0.0	0.0	24.0
Coelenterata	5.7	429.3	1110.3	1082.6	77.1
Ctenophora	1645.4	11.0	0.0	604.5	6706.9
Pteropoda	23.7	0.0	536.3	774.6	24.6
Decapoda (Larvae)	262.6	73.8	130.9	80.0	243.4
Polychaeta	0.0	0.0	0.0	0.0	5.9
Mysidacea	0.0	2779.0	0.0	0.0	0.0
Fish (Larvae)	4.1	174.9	5.7	9.6	2.6
Total	2606.3	3764.7	3299.7	3811.1	8441.1

Table IV-5. Ash content of the different taxonomic groups collected by oblique tows in Frobisher Bay and at Brevoort Island.

	Percent ash														
	TC1			TC3			TC4			TC5			TC9		
Taxonomic group	N	%	S.D.	N	%	S.D.	N	%	S.D.	N	%	S.D.	N	%	S.D.
Amphipoda (Hyperiid)	1	17.8	-	-	-	-	3	28.0	0.1	6	27.6	0.7	1	19.8	-
Amphipoda (Gammarid)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chaetognatha	-	-	-	-	-	-	-	-	-	-	-	-	3	13.3	0.1
Euphausiacea	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Coelenterata	-	-	-	5	76.3	0.1	6	52.8	0.2	3	59.7	0.2	1	55.4	-
Ctenophora	3	57.4	0.1	-	-	-	-	-	-	3	66.9	1.4	4	56.1	0.9
Pteropoda	1	10.4	-	-	-	-	2	39.8	0.3	3	35.6	0.1	-	-	-
Decapoda (Larvae)	-	-	-	-	-	-	-	-	-	-	-	-	1	11.6	-
Polychaeta	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mysidacea	-	-	-	6	29.2	1.0	-	-	-	-	-	-	-	-	-
Fish (Larvae)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Appendix V

Table V-1. Coordinates of stations sampled in the Brevoort Island area, 1979.

Station Number	North Latitude	West Longitude
79-A	63°18.55'	64°08.23'
79-B	63°19.4'	64°10.1'
79-C	63°17.08'	64°07.38'
79-D	63°15.0'	64°07.4'
79-E	63°13.0'	64°08.3'

Table V-2. Associated data for stations sampled by grab in the Brevoort Island area in 1979.

Station	Date	Time (AST)	Time (GMT)	No. of grabs	Sampled area (m^2)	Depth (m)	Temp. (°C)	Sal. (°/₀₀)
79-A	8 Aug 79	1245	1645	5	0.33	31	-0.51	33.047
79-B	10 Aug 79	1030	1430	5	0.33	12	0.15	-
79-C	12 Aug 79	0930	1330	5	0.33	73	-0.8	33.163
79-D	11 Aug 79	1730	2130	3	0.27	152	-1.2	33.383
79-E	11 Aug 79	0930	1330	3	0.27	245	-1.2	33.383

Table V-3. Associated data for stations sampled by dredge in the Brevoort Island area in 1979.

Station	Date	Time (AST)	Time (GMT)	Dredge	Water depth (m)	Sampled area (m^2)	Dry wt. (g)
79-A	10 Aug 79	1400	1800	D-4	31	327	141.17
		1430	1830	D-5	31	327	182.88
79-C	12 Aug 79	1300	1700	D-9	73	409	131.64
		1330	1730	D-10	73	293	65.05
		1400	1800	D-11	73	456	303.54

Table V-4. Species of zoobenthos collected from all stations in the Brevoort Island area, 1979.

Species	No.	Species	No.
ANNELIDA: Hirudinea	1	*Eusyllis blomstrandi*	
Leech		*Exogone dispar*	
		Exogone hebes	
ANNELIDA: Oligochaeta	3	*Exogone naidina*	
Enchytraeus capitatus		*Exogone verugera*	
Enchytraeidae		*Fabricia sabella*	
Peloscolex gabriellae		*Flabelligera affinis*	
		*Gattyana cirrosa**	
ANNELIDA: Polychaeta	112	*Harmothoe extenuata**	
Ammotrypane breviata		*Harmothoe imbricata*	
Ampharete acutifrons		*Harmothoe oerstedi*	
Ampharete arctica		*Heteromastus* sp.	
Ampharete goesi		*Lanassa venusta*	
Ampharetid		*Laonice cirrata*	
Antinoella badia		*Laonome kroyeri*	
Antinoella sarsi		*Laphania boecki*	
Apistobranchus tullbergi		*Leaena abranchiata*	
Aricidea jeffreysi		*Leiochone polaris*	
Aricidea suecica		*Lumbrineris minuta*	
Autolytus cornutus		*Lysippe labiata*	
Autolytus prismaticus		*Maldane sarsi*	
Autolytus prolifer		*Melinna cristata*	
Autolytus sp. a		*Micronephthys minuta*	
Autolytus sp. b		*Microphthalmus aberrans*	
Brada villosa		*Microspio* sp.	
Brania clavata		*Myriochele heeri*	
Capitella capitata		*Myriochele oculata*	
Chaetozone setosa		*Mystides borealis*	
Chaetozone sp.		*Myzostomum* sp.*	
Chone duneri		*Nephtys ciliata*	
Chone infundibuliformis		*Nephtys paradoxa*	
Chone sp.		*Nereimyra aphroditoides*	
Clymenella catenata		*Nereis pelagica*	
Cossura longocirrata		*Nerinides* sp.	
Dysponetus pygmaeus		*Nicolea zostericola*	
Ephesiella minuta		*Onuphis conchylega*	
Eteone flava		*Owenia fusiformis*	
Eteone longa		*Parahesione* sp.	
Euchone analis		*Paraonis* sp. a	
Euchone papillosa		*Paraonis* sp. b	
Eumida sp. a		*Pectinaria granulata*	
Eumida sp. b		*Pectinaria hyperborea*	

Table V-4. Continued.

Species	No.
ANNELIDA: Polychaeta	
Pholoe minuta	
Phyllodoce groenlandica	
Phyllodoce mucosa	
Pionosyllis compacta	
Pionosyllis sp.	
*Pista flexuosa**	
Pista maculata	
Polycirrus medusa	
Polydora caeca	
Polydora caulleryi	
Polydora quadrilobata	
Praxillella affinis	
Praxillella praetermissa	
Praxillura sp.	
Prionospio steenstrupi	
Pygospio elegans	
Rhodine loveni	
Sabella crassicornis	
Sabellides octocirrata	
Scalibregma inflatum	
Scoloplos armiger	
Sphaerodorum gracile	
Sphaerodorum sp.	
Sphaerosyllis erinaceus	
Spio filicornis	
Spirorbis spirillum	
Spirorbis sp.	
Stauronereis caecus	
Syllis cornuta	
Syllis fasciata	
Syllis sp.	
Terebellides stroemi	
Tharyx acutus	
Thelepus cincinnatus	
Travisia forbesi	
Travisia sp.	
Trichobranchus glacialis	
ARTHROPODA: Amphipoda Amphipods	1
ARTHROPODA: Cirripedia *Balanus balanus*	1
ARTHROPODA: Cumacea	15
Campylaspis rubicunda	
Cumella sp. a	
Diastylis goodsiri	
Diastylis lepechini	
Diastylis rathkei	
Diastylis scorpioides	
Eudorella spitzbergensis	
Eudorellopsis deformis	
Eudorellopsis sp. a	
Lamprops fuscata	
Leptostylis longimana	
Leucon acutirostris	
Leucon nasica	
Leucon nasicoides	
Petalosarsia declivis	
ARTHROPODA: Decapoda	6
*Argis dentata**	
*Lebbeus groenlandicus**	
*Lebbeus polaris**	
*Sabinea septemcarinata**	
*Sclerocrangon boreas**	
*Spirontocaris spinus**	
ARTHROPODA: Isopoda	14
*Arcturus baffini**	
*Dajus mysidis**	
Eugerda globiceps	
Eurycope pygmaea	
Ilyarachna denticulata	
Ilyarachna sp.	
Mesidotea sabini	
Munna kroyeri	
Munna limicola	
Munna sp. a	
Munna sp. b	
Pleurogonium inerme	
Pleurogonium spinosissimum	
Synidotea nodulosa	
ARTHROPODA: Mysidacea	1
Mysis oculata	

Table V-4. Continued.

Species	No.	Species	No.
ARTHROPODA: Ostracoda	11	COELENTERATA: Anthozoa	2
Cythereis tuberculata		*Drifa glomerata*	
Cythereis sp. b		Anthozoan	
Cythereis sp. d			
Cytheridea punctilata		COELENTERATA: Hydrozoa	1
Cytheridea sp. a		Hydrozoan	
Hemicythere concinna			
Hemicythere finmarchica		COELENTERATA: Scyphozoa	1
Hemicythere quadridentata		*Lucernaria quadricornis**	
Hemicythere sp. a			
Macrocythere simplex		ECHINODERMATA: Asteroidea	4
Philomedes globosus		*Leptasterias groenlandica**	
		Pteraster pulvillus	
ARTHROPODA: Pycnogonida	7	*Solaster papposus**	
Eurycyde hispida		*Stephanasterias albula*	
Nymphon elegans			
Nymphon gracile		ECHINODERMATA: Crinoidea	1
*Nymphon grossipes**		*Heliometra glacialis*	
Nymphon hirtipes			
*Nymphon longitarse**		ECHINODERMATA: Echinoidea	1
Pseudopallene circularis		*Strongylocentrotus droebachiensis*	
ARTHROPODA: Tanaidacea	6	ECHINODERMATA: Holothuroidea	4
Cryptocope arctica		*Cucumaria frondosa**	
Leptognathia sp. a		*Myriotrochus rinki*	
Pseudotanais forcipatus		*Psolus fabricii*	
Pseudotanais macrocheles		Holothuroid	
Typhlotanais finmarchicus			
Tanaidacean		ECHINODERMATA: Ophiuroidea	9
		Amphiura sundevalli	
ASCHELMINTHES: Nematoda	1	*Ophiacantha bidentata*	
Nematodes		*Ophiocten sericeum*	
		Ophiopholis aculeatus	
BRACHIOPODA	1	*Ophiopus arcticus*	
Hemithyris psittacea		*Ophiura robusta*	
		Ophiura sarsi	
CHORDATA: Ascidiacea	8	*Stegophiura nodosa*	
Aplidium glabrum		*Stegophiura* sp.	
*Boltenia ovifera**			
*Cnemidocarpa finmarkiensis**		ECTOPROCTA	2
Dendroda aggregata		*Alcyonidium* sp.*	
Didemnum albidun		Bryozoans	
Kukenthalia borealis			
Molgula sp.		MOLLUSCA: Amphineura	1
Ascidians		*Tonicella marmorea**	

Table V-4. Continued.

Species	No.
MOLLUSCA: Aplacophora	1
Solenogasters	
MOLLUSCA: Gastropoda	30
Alvania cruenta	
*Buccinum hydrophanum**	
*Buccinum tenue**	
*Buccinum undatum**	
Cingula arenaria	
Cingula moerchi	
Colus tortuosus	
Cylichna alba	
Cylichna occulta	
Diaphana minuta	
Hydrobia minuta	
Hydrobia sp. a	
Lepeta caeca	
Margarites costalis	
Margarites helicinus	
Margarites olivaceus	
Margarites umbilicalis	
Margarites sp.	
Moelleria costulata	
Natica clausa	
Neptunea despecta	
Oenopota arctica	
Oenopota bicarinata	
Oenopota incisula	
Oenopota turricula	
Retusa obtusa	
Tachyrhynchus reticulatus	
*Trichotropis bicarinata**	
Trichotropis borealis	
*Trichotropis conica**	
MOLLUSCA: Pelecypoda	27
Astarte borealis	
Astarte montagui	
Axinopsida orbiculata	
*Chlamys islandica**	
Crenella decussata	
Cuspidaria obesa	
Dacrydium vitreum	
Hiatella arctica	
Lyonsiella sp. a	
Macoma calcarea	
Macoma torelli	
Montacuta maltzani	
Musculus discors	
Musculus niger	
Mya pseudoarenaria	
Mya truncata	
Mysella tumida	
Nucula belloti	
Nuculana minuta	
Nuculana pernula	
Pandora glacialis	
Pecten groenlandicus	
Thracia myopsis	
Thracia septentrionalis	
Thyasira gouldi	
Yoldiella fraterna	
Yoldiella frigida	
NEMERTINA	1
Nemerteans	
PLATYHELMINTHES: Turbellaria	1
Turbellarian	
PORIFERA	1
Sponges	
PRIAPULIDA	1
Priapulus caudatus	
SIPUNCULIDA	3
Golfingia margaritacea	
Phascolion strombi	
Sipunculid	
CHORDATA: Osteichthyes	7
*Aspidophoroides olriki**	
*Gymnocanthus tricuspis**	
*Icelus bicornis**	
*Icelus spatula**	
*Myoxocephalus scorpius**	
*Triglops murrayi**	

Table V-4. Continued.

Species	No.	Species	No.
CHORDATA: Osteichthyes			
*Triglops pingeli**			
Total	286		

*Collected by dredge only.

Table V-5. Densities of zoobenthic invertebrates collected by grab from stations in the Brevoort Island area. Data expressed as number of individuals per square metre.

Species	79-A	79-B	79-C	79-D	79-E
ANNELIDA: Hirudinea					
Leech		3			8
ANNELIDA: Oligochaeta					
Enchytraeus capitatus	72	327	21	8	
Enchytraeidae		681			
Peloscolex gabriellae	9	2949	18	12	
ANNELIDA: Polychaeta					
Ammotrypane breviata	69		15		
Ampharete acutifrons	3			4	36
Ampharete arctica				16	
Ampharete goesi					4
Ampharetid			3	8	
Antinoella badia					4
Antinoella sarsi					4
Apistobranchus tullbergi	75		9		
Aricidea jeffreysi	12		24	36	80
Aricidea suecica	9		15	28	44
Autolytus cornutus			48		
Autolytus prismaticus			3		
Autolytus prolifer			9	4	
Autolytus sp. a			3		
Autolytus sp. b			6		
Brada villosa	3				
Brania clavata			45		
Capitella capitata	54	774	18		
Chaetozone setosa	945	297	255	1232	384
Chaetozone sp.		264	108	8	
Chone duneri	6				
Chone infundibuliformis			117	28	
Chone sp.			366	52	44
Clymenella catenata			3	4	4
Cossura longocirrata			3	88	
Dysponetus pygmaeus	12	3			
Ephesiella minuta	87		15	4	12
Eteone flava	15		3		
Eteone longa		9	39	24	48
Euchone analis	9			12	4
Euchone papillosa	21		30	52	196
Eumida sp. a			3	4	
Eumida sp. b			75	28	

Table V-5. Continued.

Species	79-A	79-B	79-C	79-D	79-E
Eusyllis blomstrandi			45		
Exogone dispar			6	88	20
Exogone hebes	27	3327	9	184	28
Exogone naidina			51	68	20
Exogone verugera	3		42	120	12
Fabricia sabella	237		9		
Flabelligera affinis			3		
Harmothoe imbricata	12		141	8	
Harmothoe oerstedi			1*		
Heteromastus sp.	15		39	184	92
Lanassa venusta				8	
Laonice cirrata					4
Laonome kroyeri				4	
Laphania boecki			15		8
Leaena abranchiata				4	4
Leiochone polaris			3		
Lumbrineris minuta			3	20	
Lysippe labiata			3		
Maldane sarsi					4
Melinna cristata				40	
Micronephthys minuta			9		
Microphthalmus aberrans		6			
Microspio sp.	9	510			
Myriochele heeri					40
Myriochele oculata	6		27	184	676
Mystides borealis			24	12	
Nephtys ciliata			15		4
Nephtys paradoxa			3		
Nereimyra aphroditoides	3		3		
Nereis pelagica			6		
Nerinides sp.		6			
Nicolea zostericola			3		
Onuphis conchylega				432	76
Owenia fusiformis	207			8	68
Parahesione sp.	72		9		
Paraonis sp. a			90	220	
Paraonis sp. b				4	
Pectinaria granulata	45		3		
Pectinaria hyperborea	81				
Pholoe minuta	93		123	400	176
Phyllodoce groenlandica				8	12
Phyllodoce mucosa	3				
Pionosyllis compacta				12	
Pionosyllis sp.	111		45	4	4

Table V-5. Continued.

Species	79-A	79-B	79-C	79-D	79-E
Pista maculata			57	12	
Polycirrus medusa			36	84	8
Polydora caeca	96		36	16	4
Polydora caulleryi			3	4	
Polydora quadrilobata	6		21		
Praxillella affinis				8	8
Praxillella praetermissa	6	33	18	16	4
Praxillura sp.				4	
Prionospio steenstrupi	18		39	20	228
Pygospio elegans	6	18	33	48	16
Rhodine loveni				8	4
Sabella crassicornis			3		
Sabellides octocirrata	33		57	8	
Scalibregma inflatum	6	3	12	96	16
Scoloplos armiger	162	33	99	104	96
Sphaerodorum gracile	3		51	36	32
Sphaerodorum sp.				4	
Sphaerosyllis erinaceus			198	64	12
Spio filicornis	18	36	6		
Spirorbis spirillum			39		
Spirorbis sp.		3765			
Stauronereis caecus		9	3	16	
Syllis cornuta				4	
Syllis fasciata			27	4	
Syllis sp.		3	12	8	
Terebellides stroemi			18	36	
Tharyx acutus			45	72	20
Thelepus cincinnatus			61*	4	
Travisia forbesi		3			
Travisia sp.		243			12
Trichobranchus glacialis				8	
Pieces of polychaetes	X	X	X	X	X
ARTHROPODA: Amphipoda					
Amphipods	1647	1893	513	256	228
ARTHROPODA: Cirripedia					
Balanus balanus			3		
ARTHROPODA: Cumacea					
Campylaspis rubicunda			3		
Cumella sp. a			90	20	4
Diastylis goodsiri			3		4

Table V-5. Continued.

Species	79-A	79-B	79-C	79-D	79-E
Diastylis lepechini			3	4	
Diastylis rathkei	6678	9	6		28
Diastylis scorpioides					4
Eudorella spitzbergensis					4
Eudorellopsis deformis	3		3		
Eudorellopsis sp. a				12	
Lamprops fuscata	72	30	15		16
Leptostylis longimana			3		
Leucon acutirostris					4
Leucon nasica			18		
Leucon nasicoides			15		
Petalosarsia declivis			3		
ARTHROPODA: Isopoda					
Eugerda globiceps			12		
Eurycope pygmaea			3		
Ilyarachna denticulata					4
Ilyarachna sp.					4
Mesidotea sabini	12				
Munna kroyeri	3		39		
Munna limicola	3				
Munna sp. a			9		
Munna sp. b			6		
Pleurogonium inerme			15	4	24
Pleurogonium spinosissimum	18		3	4	
Synidotea nodulosa	6				
ARTHROPODA: Mysidacea					
Mysis oculata					16
ARTHROPODA: Ostracoda					
Cythereis tuberculata	183				60
Cythereis sp. b	15				
Cythereis sp. d			15	64	40
Cytheridea punctilata	342		120	100	484
Cytheridea sp. a				16	
Hemicythere concinna			15	28	
Hemicythere firmarchica				48	72
Hemicythere quadridentata			45	4	
Hemicythere sp. a			30	4	
Macrocythere simplex	33		12		
Philomedes globosus	462		138	408	720

Table V-5. Continued.

Species	79-A	79-B	79-C	79-D	79-E
ARTHROPODA: Pycnogonida					
Eurycyde hispida			33		
Nymphon elegans			6		
Nymphon gracile			9		
Nymphon hirtipes			3		
Pseudopallene circularis			3		
ARTHROPODA: Tanaidacea					
Cryptocope arctica			51	4	
Leptognathia sp. a	198		21		52
Pseudotanais forcipatus			3		4
Pseudotanais macrocheles					52
Typhlotanais firmarchicus	234		3	40	32
Tanaidacean	3				
ASCHELMINTHES: Nematoda					
Nematodes	237	1605	1296	1408	40
BRACHIOPODA					
Hemithyris psittacea			18	24	
CHORDATA: Ascidiacea					
Aplidium glabrum			9		
Dendrodoa aggregata			18		
Didemnum albidum			9		
Kukenthalia borealis			9		
Molgula sp.	6				
Ascidians	12		6		
COELENTERATA: Anthozoa					
Drifa glomerata				X	
Anthozoan				4	
COELENTERATA: Hydrozoa					
Hydrozoan			X	X	
ECHINODERMATA: Asteroidea					
Pteraster pulvillus					4
Stephanasterias albula			12		
ECHINODERMATA: Crinoidea					
Heliometra glacialis			1*		

Table V-5. Continued.

Species	79-A	79-B	79-C	79-D	79-E
ECHINODERMATA: Echinoidea					
Strongylocentrotus droebachiensis			102	20	
ECHINODERMATA: Holothuroidea					
Myriotrochus rinki	21		3		
Psolus fabricii				24	
Holothuroid			6		
ECHINODERMATA: Ophiuroidea					
Amphiura sundevalli				4	
Ophiacantha bidentata			12		
Ophiocten sericeum			21	16	80
Ophiopholis aculeatus			6		
Ophiopus arcticus			84		
Ophiura robusta	3	3	117	180	8
Ophiura sarsi				8	
Stegophiura nodosa	306				12
Stegophiura sp.	3				
ECTOPROCTA					
Bryozoans		X	X	X	
MOLLUSCA: Aplacophora					
Solenogasters			6		
MOLLUSCA: Gastropoda					
Alvania cruenta	12				
Cingula arenaria	6		3		
Cingula moerchi					4
Colus tortuosus	3				
Cylichna alba	9		3		16
Cylichna occulta	18			20	
Diaphana minuta	3				
Hydrobia minuta					4
Hydrobia sp. a		18			
Lepeta caeca			3	52	24
Margarites costalis			9		
Margarites helicinus		3	9		
Margarites olivaceus			3		4
Margarites umbilicalis	3				
Margarites sp.		3			
Moelleria costulata	3		6	20	
Natica clausa	3				
Neptunea despecta	3		3		

Table V-5. Continued.

Species	79-A	79-B	79-C	79-D	79-E
Oenopota arctica	6				
Oenopota bicarinata	6	3			
Oenopota incisula					4
Oenopota turricula	15				
Retusa obtusa	21		3	20	52
Tachyrhynchus reticulatus			6		
Trichotropis borealis	9			8	
MOLLUSCA: Pelecypoda					
Astarte borealis	258	21		20	20
Astarte montagui	666		42	732	644
Axinopsida orbiculata	312				68
Crenella decussata	9		12	76	16
Cuspidaria obesa					4
Dacrydium vitreum			3	4	84
Hiatella arctica	24		75		
Lyonsiella sp. a	21				
Macoma calcarea	78		75	40	252
Macoma torelli	138			124	20
Montacuta maltzani		507			
Musculus discors			6	4	40
Musculus niger	105				
Mya pseudoarenaria	63				
Mya truncata	6		6		
Mysella tumida	6				
Nucula belloti			51	20	156
Nuculana minuta	90		33	292	60
Nuculana pernula	21				44
Pandora glacialis	12				
Pecten groenlandicus			9		4
Thracia myopsis	12				
Thracia septentrionalis	81	21	9	20	8
Thyasira gouldi	81		315	448	268
Yoldiella fraterna				4	
Yoldiella frigida	3			60	528
NEMERTINA					
Nemerteans	120	9	90	184	80
PLATYHELMINTHES: Turbellaria					
Turbellarian			24	4	
PORIFERA					
Sponges			X		

Table V-5. Continued.

Species	79-A	79-B	79-C	79-D	79-E
PRIAPULIDA					
Priapulus caudatus			15	28	
SIPUNCULIDA					
Golfingia margaritacea				28	
Phascolion strombi	390		12	4	
Sipunculid					4
TOTAL	15798	17433	6702	9280	6992

*Sample value used because of disproportionate representation.

Table V-6. Biomass of zoobenthic invertebrates collected by grab from stations in the Brevoort Island area. Data expressed as grams (dry weight) per square metre.

Species	79-A	79-B	79-C	79-D	79-E
ANNELIDA: Hirudinea					
Leech		0.0003			0.0424
ANNELIDA: Oligochaeta					
Enchytraeus capitatus	0.0027	0.0228	0.0018	0.0004	
Enchytraeidae		0.1164			
Peloscolex gabriellae	0.0003	0.3999	0.0015	0.0004	
ANNELIDA: Polychaeta					
Ammotrypane breviata	0.0243		0.0036		
Ampharete acutifrons	0.0006			0.0004	0.0096
Ampharete arctica				0.0016	
Ampharete goesi					0.0004
Ampharetid			0.0021	0.0004	
Antinoella badia					0.0400
Antinoella sarsi					0.0316
Apistobranchus tullbergi	0.0078		0.0009		
Aricidea jeffreysi	0.0009		0.0018	0.0016	0.0032
Aricidea suecica	0.0012		0.0012	0.0048	0.0032
Autolytus cornutus			0.0021		
Autolytus prismaticus			0.0006		
Autolytus prolifer			0.0009	0.0001	
Autolytus sp. a			0.0001		
Autolytus sp. b			0.0003		
Brada villosa	0.0024				
Brania clavata			0.0003		
Capitella capitata	0.0036	0.2127	0.0015		
Chaetozone setosa	0.2277	0.0813	0.0531	0.2992	0.2512
Chaetozone sp.		0.0564	0.0309	0.0004	
Chone duneri	0.0009				
Chone infundibuliformis			0.1410	0.0836	
Chone sp.			0.0459	0.0040	0.0052
Clymenella catenata			0.0135	0.1096	0.0012
Cossura longocirrata			0.0003	0.0020	
Dysponetus pygmaeus	0.0006	0.0006			
Ephesiella minuta	0.0042		0.0012	0.0012	0.0016
Eteone flava	0.0042		0.0051		
Eteone longa		0.1443	0.0156	0.0088	0.0112
Euchone analis	0.0027			0.0168	0.0008
Euchone papillosa	0.0024		0.0102	0.0020	0.0088
Eumida sp. a			0.0015	0.0036	
Eumida sp. b			0.0036	0.0016	

Table V-6. Continued.

Species	79-A	79-B	79-C	79-D	79-E
Eusyllis blomstrandi			0.0102		
Exogone dispar			0.0012	0.0036	0.0008
Exogone hebes	0.0009	0.1413	0.0003	0.0072	0.0020
Exogone naidina			0.0012	0.0016	0.0012
Exogone verugera	0.0003		0.0024	0.0052	0.0012
Fabricia sabella	0.0108		0.0012		
Flabelligera affinis			0.0480		
Harmothoe imbricata	0.0252		0.1407	0.0132	
Harmothoe oerstedi			1.3824*		
Heteromastus sp.	0.0012		0.0033	0.0136	0.0108
Lanassa venusta				0.0040	
Laonice cirrata					0.0040
Laonome kroyeri				0.0016	
Laphania boecki			0.0150		0.0032
Leaena abranchiata				0.0032	0.0064
Leiochone polaris			0.0012		
Lumbrineris minuta			0.0018	0.0080	
Lysippe labiata			0.0009		
Maldane sarsi					0.0008
Melinna cristata				0.1196	
Micronephthys minuta			0.0018		
Microphthalmus aberrans		0.0006			
Microspio sp.	0.0009	0.4191			
Myriochele heeri					0.0020
Myriochele oculata	0.0021		0.0084	0.0680	0.1900
Mystides borealis			0.0015	0.0012	
Nephtys ciliata			0.5013		0.1364
Nephtys paradoxa			0.0024		
Nereimyra aphroditoides	0.0024		0.0042		
Nereis pelagica			0.0135		
Nerinides sp.		0.0156			
Nicolea zostericola			0.0024		
Onuphis conchylega				6.3784	0.5200
Owenia fusiformis	0.1671			0.0016	0.1652
Parahesione sp.	0.0078		0.0006		
Paraonis sp. a			0.0042	0.0076	
Paraonis sp. b				0.0004	
Pectinaria granulata	1.8084		0.1110		
Pectinaria hyperborea	0.9600				
Pholoe minuta	0.0162		0.0129	0.0496	0.0224
Phyllodoce groenlandica				0.1024	0.0008
Phyllodoce mucosa	0.0003				
Pionosyllis compacta				0.0012	
Pionosyllis sp.	0.0018		0.0021	0.0004	0.0001

Table V-6. Continued.

Species	79-A	79-B	79-C	79-D	79-E
Pista maculata			3.0222	0.1100	
Polycirrus medusa			0.0225	0.0220	0.0028
Polydora caeca	0.0093		0.0126	0.0020	0.0004
Polydora caulleryi			0.0009	0.0004	
Polydora quadrilobata	0.0015		0.0015		
Praxillella affinis				0.0008	0.0024
Praxillella praetermissa	0.0129	0.0834	0.0063	0.0104	0.0052
Praxillura sp.				0.0052	
Prionospio steenstrupi	0.0036		0.0033	0.0024	0.0464
Pygospio elegans	0.0003	0.0012	0.0021	0.0004	0.0004
Rhodine loveni				0.0060	0.0016
Sabella crassicornis			0.0510		
Sabellides octocirrata	0.0105		0.0102	0.0016	
Scalibregma inflatum	0.0033	0.0033	0.0060	0.0616	0.0784
Scoloplos armiger	0.0714	0.3087	0.0714	0.1984	0.1856
Sphaerodorum gracile	0.0006		0.0198	0.0072	0.0052
Sphaerodorum sp.				0.0002	
Sphaerosyllis erinaceus			0.0030	0.0008	0.0004
Spio filicornis	0.0012	0.0090	0.0009		
Spirorbis spirillum			0.0042		
Spirorbis sp.		0.1506			
Stauronereis caecus		0.0006	0.0006	0.0008	
Syllis cornuta				0.0064	
Syllis fasciata			0.0357	0.0004	
Syllis sp.		0.0018	0.0015	0.0008	
Terebellides stroemi			0.0372	0.0800	
Tharyx acutus			0.0030	0.0072	0.0008
Thelepus cincinnatus			12.6840*	0.0024	
Travisia forbesi		0.0579			
Travisia sp.		1.1415			0.0044
Trichobranchus glacialis				0.0124	
Pieces of polychaetes	0.0186	0.0132	0.0198	0.0864	0.0428
ARTHROPODA: Amphipoda					
Amphipods	0.4545	1.9947	0.1560	0.2692	0.0260
ARTHROPODA: Cirripedia					
Balanus balanus			0.0003		
ARTHROPODA: Cumacea					
Campylaspis rubicunda			0.0021		
Cumella sp. a			0.0171	0.0020	0.0008
Diastylis goodsiri			0.0099		0.0212

Table V-6. Continued.

Species	79-A	79-B	79-C	79-D	79-E
Diastylis lepechini			0.0009	0.0012	
Diastylis rathkei	5.0949	0.0006	0.0021		0.0032
Diastylis scorpioides					0.0028
Eudorella spitzbergensis					0.0008
Eudorellopsis deformis	0.0006		0.0003		
Eudorellopsis sp. a				0.0012	
Lamprops fuscata	0.0054	0.0024	0.0012		0.0012
Leptostylis longimana			0.0003		
Leucon acutirostris					0.0004
Leucon nasica			0.0021		
Leucon nasicoides			0.0021		
Petalosarsia declivis			0.0001		
ARTHROPODA: Isopoda					
Eugerda globiceps			0.0003		
Eurycope pygmaea			0.0003		
Ilyarachna denticulata					0.0012
Ilyarachna sp.					0.0004
Mesidotea sabini	0.1776				
Munna kroyeri	0.0006		0.0018		
Munna limicola	0.0009				
Munna sp. a			0.0009		
Munna sp. b			0.0003		
Pleurogonium inerme			0.0003	0.0002	0.0008
Pleurogonium spinosissimum	0.0015		0.0009	0.0002	
Synidotea nodulosa	0.0054				
ARTHROPODA: Mysidacea					
Mysis oculata					0.0992
ARTHROPODA: Ostracoda					
Cythereis tuberculata	0.0060				0.0040
Cythereis sp. b	0.0003				
Cythereis sp. d			0.0003	0.0040	0.0024
Cytheridea punctilata	0.0126		0.0060	0.0048	0.0280
Cytheridea sp. a				0.0008	
Hemicythere concinna			0.0003	0.0016	
Hemicythere finmarchica				0.0032	0.0056
Hemicythere quadridentata			0.0006	0.0001	
Hemicythere sp. a			0.0006	0.0001	
Macrocythere simplex	0.0006		0.0003		
Philomedes globosus	0.0468		0.0147	0.0432	0.0780

Table V-6. Continued.

Species	79-A	79-B	79-C	79-D	79-E
ARTHROPODA: Pycnogonida					
Eurycyde hispida			0.0042		
Nymphon elegans			0.0900		
Nymphon gracile			0.0015		
Nymphon hirtipes			0.0009		
Pseudopallene circularis			0.0051		
ARTHROPODA: Tanaidacea					
Cryptocope arctica			0.0021	0.0012	
Leptognathia sp. a	0.0102		0.0015		0.0036
Pseudotanais forcipatus			0.0006		0.0004
Pseudotanais macrocheles					0.0012
Typhlotanais firmarchicus	0.0051		0.0006	0.0008	0.0008
Tanaidacean	0.0001				
ASCHELMINTHES: Nematoda					
Nematodes	0.0036	0.0273	0.0156	0.0220	0.0008
BRACHIOPODA					
Hemithyris psittacea			0.0672	0.0020	
CHORDATA: Ascidiacea					
Aplidium glabrum			0.3162		
Dendrodoa aggregata			2.1384		
Didemnum albidum			0.0144		
Kukenthalia borealis			0.1737		
Molgula sp.	0.0450				
Ascidian	0.1158		0.0501		
COELENTERATA: Anthozoa					
Drifa glomerata				0.0036	
Anthozoan				0.3776	
COELENTERATA: Hydrozoa					
Hydrozoan			0.6093	0.0316	
ECHINODERMATA: Asteroidea					
Pteraster pulvillus					0.3384
Stephanasterias albula			0.0333		
ECHINODERMATA: Crinoidea					
Heliometra glacialis			- **		

Table V-6. Continued.

Species	79-A	79-B	79-C	79-D	79-E
ECHINODERMATA: Echinoidea					
Strongylocentrotus droebachiensis			- **	0.0456	
ECHINODERMATA: Holothuroidea					
Myriotrochus rinki	1.6395		0.0330		
Psolus fabricii				0.2488	
Holothuroid			0.0039		
ECHINODERMATA: Ophiuroidea					
Amphiura sundevalli				0.1180	
Ophiacantha bidentata			2.4645		
Ophiocten sericeum			1.6770	0.4252	0.9000
Ophiopholis aculeatus			5.1837		
Ophiopus arcticus			0.5040		
Ophiura robusta	0.3567	0.0222	1.6710	0.9964	2.2216
Ophiura sarsi				5.3200	
Stegophiura nodosa	3.5718				0.0256
Stegophiura sp.	0.1050				
ECTOPROCTA					
Bryozoans		0.0456	0.0726	0.0236	
MOLLUSCA: Aplacophora					
Solenogasters			0.0006		
MOLLUSCA: Gastropoda					
Alvania cruenta	0.0015				
Cingula arenaria	0.0027		0.0009		
Cingula moerchi					0.0020
Colus tortuosus	0.6276				
Cylichna alba	0.0105		0.0333		0.0592
Cylichna occulta	0.0393			0.0496	
Diaphana minuta	0.0009				
Hydrobia minuta					0.0016
Hydrobia sp. a		0.0039			
Lepeta caeca			0.0324	0.3768	0.0592
Margarites costalis			0.0009		
Margarites helicinus		0.0066	0.0006		
Margarites olivaceus			0.0033		0.0504
Margarites umbilicalis	0.0009				
Margarites sp.		0.0003			
Moelleria costulata	0.0003		0.0003	0.0020	
Natica clausa	0.0534				
Neptunea despecta	0.0006		0.0201		

Table V-6. Continued.

Species	79-A	79-B	79-C	79-D	79-E
Oenopota arctica	0.0066				
Oenopota bicarinata	0.0060	0.0465			
Oenopota incisula					0.0016
Oenopota turricula	0.0045				
Retusa obtusa	0.0021		0.0012	0.0020	0.0076
Tachyrhynchus reticulatus			0.0747		
Trichotropis borealis	0.1023			0.0016	
MOLLUSCA: Pelecypoda					
Astarte borealis	1.9665	0.1371		0.0736	0.4500
Astarte montagui	7.8324		0.2640	1.9204	2.0076
Axinopsida orbiculata	0.0231				0.0088
Crenella decussata	0.0075		0.0072	0.0316	0.0044
Cuspidaria obesa					0.0036
Dacrydium vitreum			0.0001	0.0008	0.0096
Hiatella arctica	0.0012		0.0015		
Lyonsiella sp. a	0.0255				
Macoma calcarea	2.3232		5.3850	1.5664	7.3256
Macoma torelli	0.0354			0.1056	0.0324
Montacuta maltzani		0.0948			
Musculus discors			0.0660	0.0440	0.0020
Musculus niger	0.0075				
Mya pseudoarenaria	0.0279				
Mya truncata	0.6141		0.3969		
Mysella tumida	0.0003				
Nucula belloti			0.6540	0.0584	0.4176
Nuculana minuta	0.2367		0.1410	0.9732	0.1804
Nuculana pernula	0.0036				0.3912
Pandora glacialis	0.1149				
Pecten groenlandicus			0.0804		0.0004
Thracia myopsis	0.4722				
Thracia septentrionalis	0.1059	0.0930	0.0366	0.0008	0.0012
Thyasira gouldi	0.0474		0.0540	0.0892	0.0472
Yoldiella fraterna				0.0048	
Yoldiella frigida	0.0036			0.0072	0.1600
NEMERTINA					
Nemerteans	0.0399	0.0990	0.0549	0.1044	0.0228
PLATYHELMINTHES: Turbellaria					
Turbellarian			0.0303	0.0012	
PORIFERA					
Sponges			0.1899		

Table V-6. Continued.

Species	79-A	79-B	79-C	79-D	79-E
PRIAPULIDA					
Priapulus caudatus			0.0006	0.0056	
SIPUNCULIDA					
Golfingia margaritacea				0.0032	
Phascolion strombi	1.9923		0.0009	0.0092	
Sipunculid					0.1364
TOTAL	31.8259	5.9565	41.5245	21.3401	17.0057

*Sample value used because of disproportionate representation.

**Value included with dredge data because of disproportionate representation.

Table V-7. Dry weights in grams of zoobenthos collected by dredge from stations 79-A and 79-C in 1979, Brevoort Island.

Species	79-A	79-C
ANNELIDA: Hirudinea		
Leech	-*	-
ANNELIDA: Polychaeta		
Gattyana cirrosa		-
Harmothoe extenuata		-
Harmothoe oerstedi	-	
Myzostomum sp.		-
Onuphis conchylega		-
Pista flexuosa	-	-
Pista maculata		-
Thelepus cincinnatus		-
ARTHROPODA: Amphipoda		
Amphipods	3.9480	0.8188
ARTHROPODA: Cirripedia		
Balanus balanus	1.0200	0.5384
ARTHROPODA: Cumacea		
Diastylis rathkei	-	-
ARTHROPODA: Decapoda		
Argis dentata	-	
Lebbeus groenlandicus	2.0600	
Lebbeus polaris	1.0000	
Sabinea septemcarinata	0.2804	-
Sclerocrangon boreas	1.3400	
Spirontocaris spinus	0.2589	2.0773
ARTHROPODA: Isopoda		
Arcturus baffini		9.6000
Dajus mysidis	-	
Mesidotea sabini	2.7100	
Synidotea nodulosa	-	
ARTHROPODA: Mysidacea		
Mysis oculata	58.8000	
ARTHROPODA: Pycnogonida		
Nymphon elegans		0.1548
Nymphon grossipes		-
Nymphon hirtipes		1.7928
Nymphon longitarse		-

Table V-7. Continued.

Species	79-A	79-C
CHORDATA: Ascidiacea		
Boltenia ovifera		2.2678
Cnemidocarpa finmarkiensis		
Dendrodoa aggregata		0.4630
Kukenthalia borealis		0.9641
COELENTERATA: Anthozoa		
Drifa glomerata		4.1462
COELENTERATA: Scyphozoa		
Lucernaria quadricornis		-
ECHINODERMATA: Asteroidea		
Leptasterias groenlandica	0.1591	0.3471
Solaster papposus		5.6255
Stephanasterias albula	-	0.1846
ECHINODERMATA: Crinoidea		
Heliometra glacialis		315.8300
ECHINODERMATA: Echinoidea		
Strongylocentrotus droebachiensis	178.6900	52.6900
ECHINODERMATA: Holothuroidea		
Cucumaria frondosa	7.4700	31.4000
ECHINODERMATA: Ophiuroidea		
Ophiacantha bidentata		5.7851
Ophiocten sericeum		-
Ophiopholis aculeatus		6.1400
Ophiura robusta	-	-
Ophiura sarsi	11.2300	25.7456
Stegophiura nodosa	-	
Stegophiura sp.	-	
ECTOPROCTA		
Alcyonidium sp.		6.2719
Bryozoans		
MOLLUSCA: Amphineura		
Tonicella marmorea	2.2800	
MOLLUSCA: Gastropoda		
Buccinum hydrophanum	0.1075	
Buccinum tenue	4.0600	

Table V-7. Continued.

Species	79-A	79-C
Buccinum undatum	-	
Colus tortuosus		0.1458
Margarites helicinus	-	
Margarites umbilicalis		-
Trichotropis bicarinata		0.5335
Trichotropis conica		-
MOLLUSCA: Pelecypoda		
Chlamys islandica		2.4036
Pandora glacialis		-
NEMERTINA		
Nemerteans		-
Total invertebrates	275.4139	475.9259
CHORDATA: Osteichthyes		
Aspidophoroides olriki		0.7784
Gymnocanthus tricuspis	33.8936	14.0923
Icelus bicornis		0.8392
Icelus spatula	1.3212	1.7793
Myoxocephalus scorpius	12.8180	
Triglops murrayi	0.1460	
Triglops pingeli	0.4575	6.8174
Total fish	48.6363	24.3066
Total	324.0502	500.2325

*Values below 0.1 g are not included.

Table V-8. Particle-size distribution (Wentworth Scale) and pH of sediments collected by grab from stations in the Brevoort Island area, 1979.

Station	Water depth (m)	Sand (.063-2.00 mm) %	Silt (.004-.063 mm) %	Clay (<.004 mm) %	pH (0.01 M $CaCl_2$)
79-A	31	86	10	4	6.8
79-B	12	95	3	2	6.8
79-C	73	64	26	10	7.2
79-D	152	77	14	9	7.2
79-E	245	65	25	10	7.2

Table V-9. Levels of nitrogen, carbon, and phosphorus in sediments collected by grab from stations in the Brevoort Island area, 1979.

Station	Total N (mg/g)	Organic C (%)	C/N Ratio	Total P (mg/g)	Extractable P (µg/g)
79-A	0.313	0.314	10.03	0.43	20
79-B	0.125	0.209	16.72	0.072	3
79-C	0.613	0.209	3.41	0.27	15
79-D	0.763	0.837	11.00	0.34	20
79-E	0.193	0.419	21.71	0.27	15